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PROPOSED

BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT FOR POLYNUCLEAR AROMATIC U-WASTES

Larry Rosengrant
Acting Chief
Treatment Technology Section

Elaine Eby
Project Manager

U.S. Environmental Protection Agency
Office of Solid Waste
401 M Street, S.W.
Washington, D.C. 20460

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The following personnel from Versar Inc. were involved in preparing this document: Mr. Jerome Strauss, Program Manager; Mr. Stephen Schwartz, Senior Technical Reviewer; Ms. Josefina Castellanos, Task Leader, Mr. Stanley Moore; Ms. Kathryn Jones; Ms. Sally Gravely; Ms. Martha Martin, Technical Editor.

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1. INTRODUCTION

Pursuant to section 3004(m) of the Resource Conservation and Recovery Act (RCRA), enacted by the Hazardous and Solid Waste Amendments (HSWA) on November 8, 1984, the Environmental Protection Agency (EPA) is proposing best demonstrated available technology (BDAT) treatment standards for polynuclear aromatic U-wastes. These wastes are identified in 40 CFR Part 261.33 and listed in Tables 1-1 and 1-2 of this document. Compliance with these BDAT treatment standards when finalized will be a prerequisite for the placement of these wastes in facilities designated as land disposal units according to 40 CFR Part 268. The effective date for finalization of these treatment standards is May 8, 1990.

This background document provides the Agency's technical support and rationale for selecting and developing the proposed treatment standards for polynuclear aromatic U-wastes. Section 2 presents waste-specific information, i.e., the industry affected and waste characterization. Section 3 discusses the applicable and demonstrated technologies used to treat the waste (or similar wastes), and Section 4 summarizes the available performance data, including data on which the treatment standards are based. Section 5 explains EPA's determination of BDAT, while Section 6 discusses the calculation of the proposed BDAT treatment standards.

The BDAT program and promulgated methodology are more thoroughly described in two additional documents: Methodology for Developing Best Demonstrated Available Technology (BDAT) Treatment Standards (USEPA 1989c) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT")(USEPA 1987e). The petition process to be followed in requesting a variance from the BDAT treatment standards is also provided in the methodology document.

For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids* (TSS) and less than 1 percent (weight basis) total organic carbon (TOC). Wastes not meeting this definition must comply with the treatment standard for nonwastewaters.

The proposed performance standards (nonwastewaters and wastewaters) for polynuclear aromatic U-wastes (constituents of concern) that were present in F and K wastes have been established based on a transfer of the treatment performance data for K001, K019, and K087. The proposed performance standards are based on the total concentration analysis of the ash and scrubber water residuals generated during incineration of the aforementioned wastes. (Detection limits were used since all the residuals of concern were below the detection limits.) For the polynuclear aromatic U-wastes (constituents of concern) not present in any of the untreated F and K waste, the Agency selected the detection limits from waste codes K019, K024, and K087. Since U051 may contain treatable concentrations of metals, the Agency is proposing performance standards for metal constituents in U051 (creosote) nonwastewaters based on a transfer of stabilization data from F006 waste. The proposed performance standards for U051 (creosote) wastewaters are based on a transfer of data from chemical precipitation followed by sludge filtration of a mixed waste sampled by EPA at Envirite Company. Details on the rationale for selection of the waste codes used to develop the proposed standards are discussed in Section 6 of this document.

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* The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, total suspended solids is measured by Method 209C, Total Suspended Solids Dried at 103 to 105°C, in Standard Methods for the Examination of Water and Wastewaters, 16th Edition (APHA, AWWA, and WPCF 1985).

Recently, additional wastewater treatment data primarily from EPA's Office of Water have been analyzed for the development of concentration-based treatment standards for many of the U and P wastes. These data include the treatment of wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P constituents. While these data were not available in time to incorporate into the preamble discussion or into this background document, these data are being placed in the administrative record for the Third Third rulemaking. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for all U and P wastewaters for which standards based on incinerator scrubber waters have been proposed. Further information on these alternative standards can be found in sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble for the proposed rule and in the document "Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents" that can be found in the RCRA docket.

The Agency is also in the process of conducting wastewater treatment tests for selected U and P chemicals using wet air oxidation, powdered activated carbon treatment (PACT), and carbon adsorption. Since much of the currently available wastewater treatment data is from the treatment of relatively low concentrations of U and P constituents in industrial wastewaters, these tests have been designed to examine the applicability of treatment technologies to wastewaters containing relatively high concentrations of U and P constituents. The data developed in these studies will be placed in the administrative record for inspection and comment, when they become available. Further information on the availability of the forthcoming wastewater treatment test data can be found in section III.A.1.h.(6.) of the preamble for the proposed rule.

EPA is proposing a method of treatment for waste codes U016 (Benz(c)acridine) U064 (1,2,7,8-dibenzopyrene) and U094 (7,12-dimethylbenz(a)anthracene). The Agency does not believe that concentration-based standards can be established for these three wastes at this time, primarily because the Agency determined that currently there are no calibration analytical reagents that are routinely available for measurement of U016, U064, and U094 in treatment residues. As a result, a concentration-based treatment standard for these waste codes is apparently not feasible and thus the Agency is proposing a treatment standard of incineration as a method of treatment for U016, U064, and U094 nonwastewaters. For U016, U064, and U094 wastewaters, EPA is proposing wet air oxidation or chemical oxidation followed by carbon adsorption, biodegradation followed by carbon adsorption, or incineration as a method of treatment. These wastewater technologies are appropriate for these constituents and have been demonstrated and/or promulgated for similar U and P waste codes.

If the concentrations of the regulated constituents (for those constituents for which concentration-based standards are proposed), as generated or treated, are lower than or equal to the BDAT treatment standard (when finalized) presented in Tables 1-1 and 1-2, then the wastes will not be prohibited from being placed in land disposal units.

Table 1-1 Proposed BDAT Treatment Standards for Polynuclear Aromatic U-Wastes (Nonwastewaters)

Waste code	Regulated constituent	Maximum for any single grab sample total composition (mg/kg)
U005	2-Acetylaminofluorene	13
U018	Benz(a)anthracene	3.6
U022	Benzo(a)pyrene	3.6
U050	Chrysene	3.6
U063	Dibenzo(a,h)anthracene	13
U120	Fluoranthene	3.6
U137	Indeno(1,2,3-c,d)pyrene	3.6
U157	3-Methylcholanthrene	33
U165	Naphthalene	5.9
U051 (creosote)	Naphthalene	1.5
	Pentachlorophenol	7.4
	Phenanthrene	1.5
	Pyrene	1.5
	Toluene	28
	Xylene(s)[a]	33
	Lead	0.51(TCLP)[b]
		Proposed method of treatment/standard[c]
U016	Benz(c)acridine	Incineration
U064	1,2,7,8-Dibenzopyrene	Incineration
U094	7,12-Dimethylbenz(a)anthracene	Incineration

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[a] The Agency is proposing one standard for xylenes in U051 that will represent the sum of the concentrations of o-xylene, m-xylene, and p-xylene present in the waste treatment residual. The basis of concentration numbers, will therefore, be the sum of the areas under all peaks identified as o-xylene, m-xylene, or p-xylene in the chromatographic spectrum.

[b] TCLP leachate concentration (mg/l).

[c] The Agency has determined that currently there are no calibration analytical reagents that are routinely available for measurement of U016, U064 and U094. As a result, a concentration-based standard for these constituents is not feasible; therefore, the Agency is proposing a method/technology as BDAT.

Table 1-2 Proposed BDAT Treatment Standards for Polynuclear Aromatic U-Wastes (Wastewaters)[a]

Waste code	Regulated constituent	Maximum for any single grab sample total composition (mg/l)
U005	2-Acetylaminofluorene	0.058
U018	Benz(a)anthracene	0.030
U022	Benzo(a)pyrene	0.030
U050	Chrysene	0.15
U063	Dibenzo(a,h)anthracene	0.012
U120	Fluoranthene	0.030
U137	Indeno(1,2,3-c,d)pyrene	0.030
U157	3-Methylcholanthrene	0.58
U165	Naphthalene	0.007
U051 (creosote)	Naphthalene	0.031
	Pentachlorophenol	0.18
	Phenanthrene	0.031
	Pyrene	0.028
	Toluene	0.028
	Xylene(s)[b]	0.032
	Lead	0.037
		Proposed methods of treatment/standard[c]
U016	Benz(c)acridine	Wet air oxidation or chemical oxidation followed by carbon adsorption, biodegradation followed by carbon adsorption, or incineration as methods of treatment.
U064	1,2,7,8-Dibenzopyrene	Wet air oxidation or chemical oxidation followed by carbon adsorption, biodegradation followed by carbon adsorption, or incineration as methods of treatment.
U094	7,12-Dimethylbenz-(a)anthracene	Wet air oxidation or chemical oxidation followed by carbon adsorption, biodegradation followed by carbon adsorption, or incineration as methods of treatment.

[a] Note: Alternative standards for these U-wastewaters are also proposed and are presented in Section III.A.7 of the preamble for this Third Third rulemaking as standards for the corresponding chemical in wastewater forms of multi-source leachate.

[b] The Agency is proposing one standard for xylenes in U051 that will represent the sum of the concentrations of o-xylene, m-xylene, and p-xylene present in the waste treatment residual. The basis of concentration numbers, will therefore, be the sum of the areas under all peaks identified as o-xylene, m-xylene, or p-xylene in the chromatographic spectrum.

[c] The Agency has determined that currently there are no calibration analytical reagents that are routinely available for measurement of U016, U064 and U094. As a result, a concentration-based standard for these constituents is not feasible; therefore, the Agency is proposing a methods/technologies as BDAT.

U-wastes. The industry that may be most affected by regulation of these wastes is the chemical manufacturing industry (SIC Codes 2865, 2869, 2899, 8071, 2951, and 2952). The degree to which an industry is affected by this proposed regulation is directly related to the degree to which the industry produces and/or uses the polynuclear aromatics. Table 2-2 gives a summary of major uses for each polynuclear aromatic.

The Agency recently carried out a survey of RCRA treatment, storage, disposal, and recycling (TSDR) facilities regarding hazardous waste managed by the facilities in 1986. Information about 1986 volumes of polynuclear aromatic U-wastes has been extracted from the survey data base and is presented in Table 2-3. Because of the nature of the survey, the Agency believes it is likely that the actual 1986 volumes of polynuclear aromatic U-wastes may be understated in Table 2-3. The volumes shown in Table 2-3 are given in gallons; however, this should not be construed to mean that the hazardous wastes are necessarily in liquid form. The concentrations of the specific constituents in polynuclear aromatic U-wastes shown in Table 2-3 are not known, except that they are greater than zero. Table 2-4 lists the facilities that may generate polynuclear aromatic U-wastes (identified from review of the 1986 TSDR Survey), identifies the States where these facilities are located, and presents the amount of the waste generated.

2.2 Waste Characterization

Because of the varied and numerous uses for the polynuclear aromatic U-wastes and because of the many ways in which they may become hazardous wastes, characterization of polynuclear aromatic U-wastes is impractical.

Table 2-5 lists the boiling point, molecular weight, empirical formula, solubility in water, and bond dissociation energy for each polynuclear aromatic U-waste.

2. INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

This section describes the industry affected by the land disposal restrictions for the polynuclear aromatic U-wastes and presents available characterization data for these wastes. The polynuclear aromatic U-wastes comprise the following wastes (see Figure 2-1 at the end of this section for the chemical structures for these polynuclear aromatic U-wastes):

Waste code	Constituent	CAS number
U005	2-Acetylaminofluorene	53-96-3
U016	Benz(c)acridine	963-89-3
U018	Benz(a)anthracene	56-55-3
U022	Benzo(a)pyrene	50-32-8
U050	Chrysene	218-01-9
U051	Creosote	8021-39-4
U063	Dibenzo(a,h)anthracene	226-36-8
U064	1,2,7,8-Dibenzopyrene	189-55-9
U094	7,12-Dimethylbenz(a)anthracene	57-97-6
U120	Fluoranthene	206-44-0
U137	Indeno(1,2,3-c,d)pyrene	193-39-5
U157	3-Methylcholanthrene	56-49-5
U165	Naphthalene	91-20-3

These U-wastes include discarded commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products, and spill residues, including contaminated water, soil, or debris, that are identified as toxic wastes (see 40 CFR Part 261.33). Because of the diversity of methods of waste generation, the composition of these wastes varies greatly. As a result, the constituents of concern may be present at concentrations varying from several parts per million to nearly the pure product.

2.1 Industry Affected

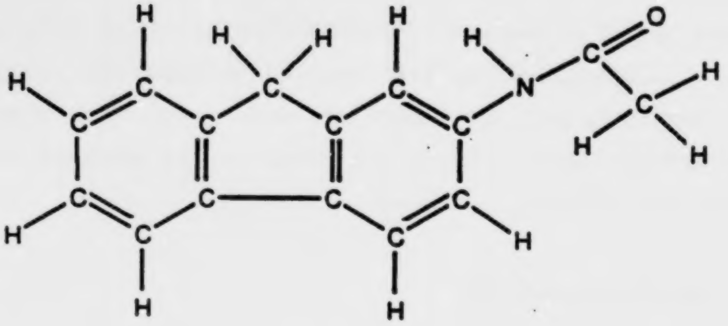
Table 2-1 (at the end of this section) presents a summary of the known domestic manufacturing capacity for the polynuclear aromatic

All of these compounds are very similiar in chemical composition and structure in that they are all fused-ring aromatic hydrocarbons. With the exception of 2-acetylaminofluorene and benz(c)acridine, these polynuclear aromatic compounds are composed solely of carbon and hydrogen. 2-Acetylaminofluorene contains nitrogen and oxygen in addition to carbon and hydrogen, and benz(c)acridine contains nitrogen in addition to carbon and hydrogen. Figure 2-1 presents the chemical structures of the polynuclear aromatic U-wastes.

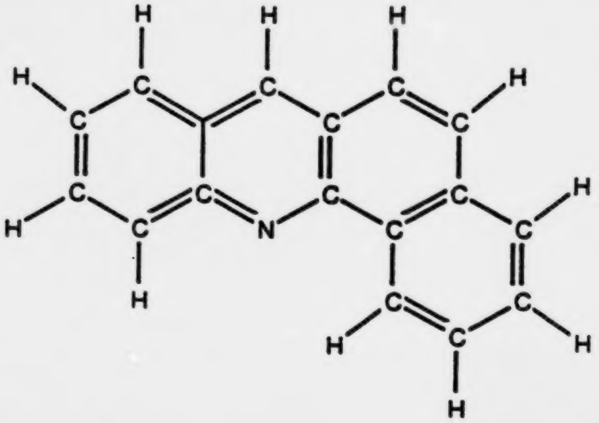
2.3 Treatability Group

Because of the similarities in the physical and chemical properties among these U-wastes, the Agency has categorized them as a single treatability group identified as polynuclear aromatics. That is, EPA believes that these wastes can be treated by the same technology to similar levels in the residue.

Figure 2-1: Chemical Structures for Polynuclear Aromatic U-Wastes

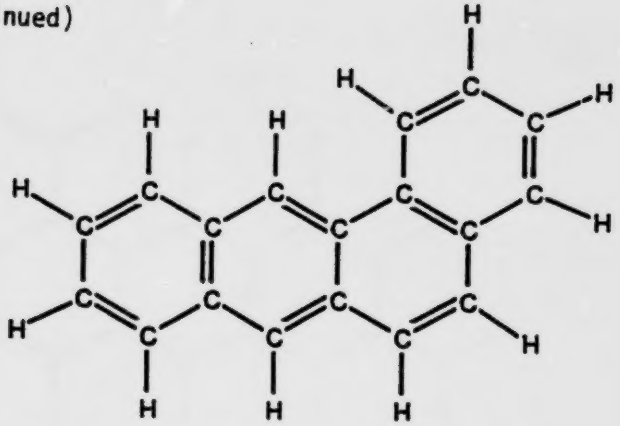


U005: 2-Acetylaminofluorene

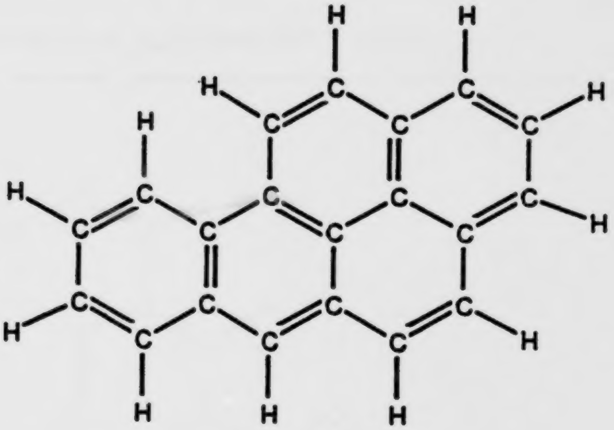


U016: Benz(c)Acridine

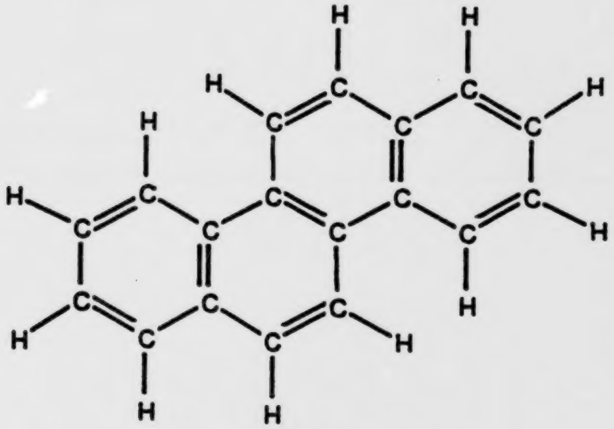
Figure 2-1 (continued)



U018: Benz(a)Anthracene

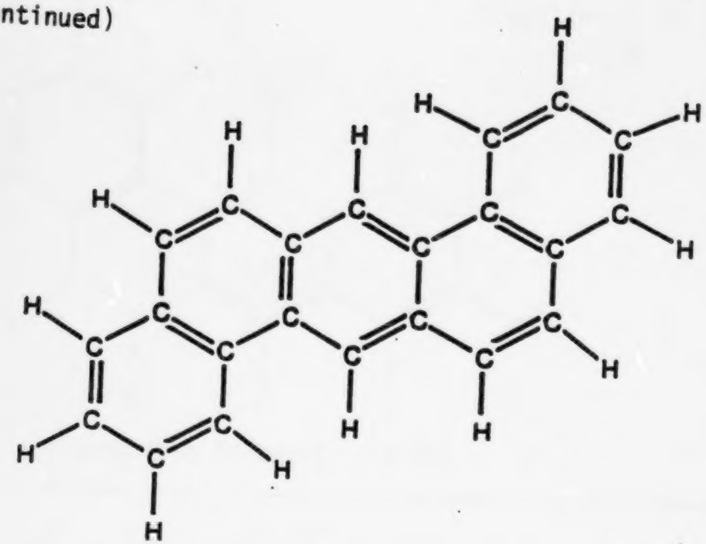


U022: Benzo(a)pyrene

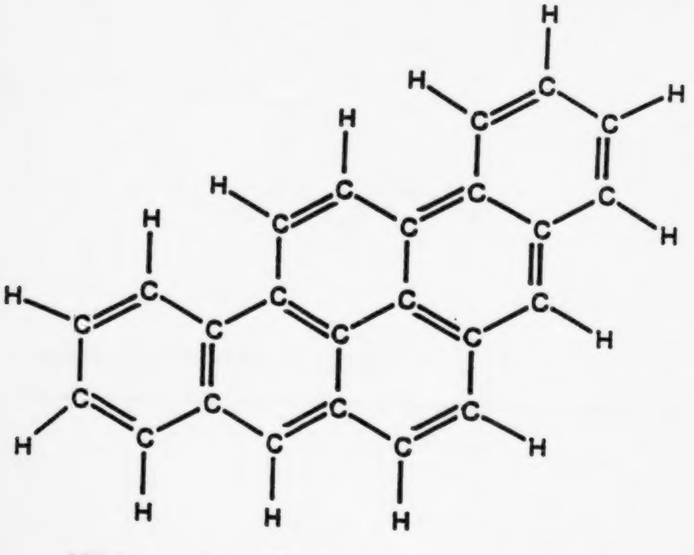


U050: Chrysene

Figure 2-1 (continued)

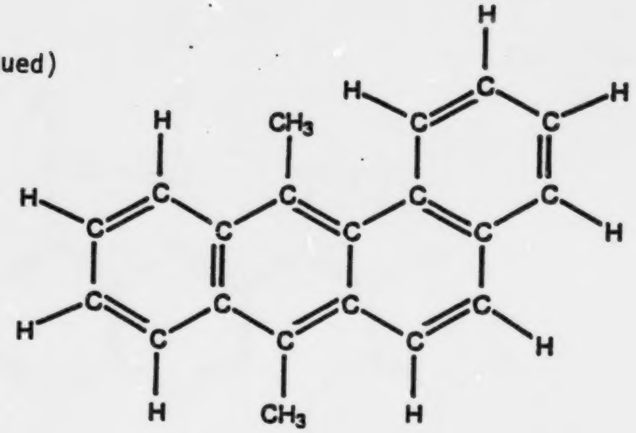


U063: Dibenzo(a,h) Anthracene

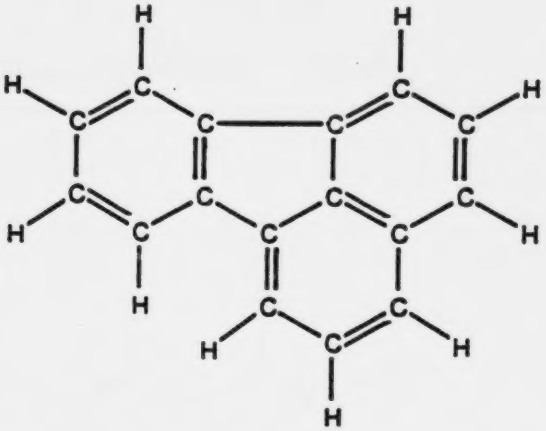


U064: 1,2,7,8-Dibenzopyrene

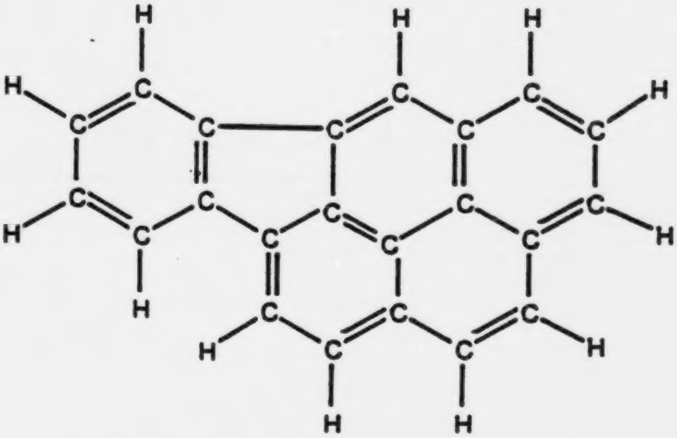
Figure 2-1 (continued)



U094: 7,12-Dimethylbenz(a)anthracene

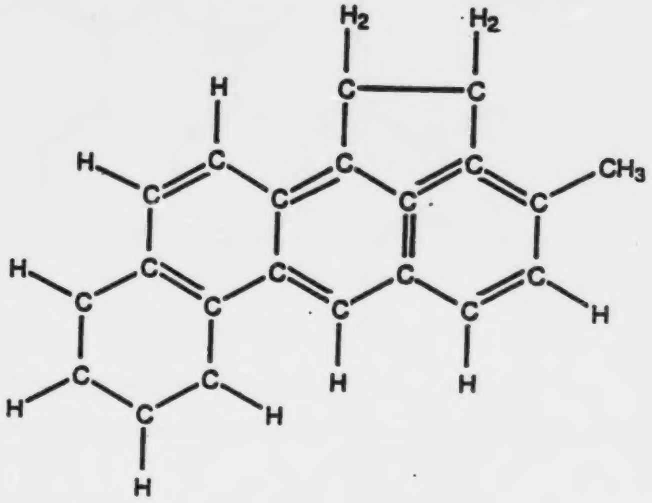


U120: Fluoranthene

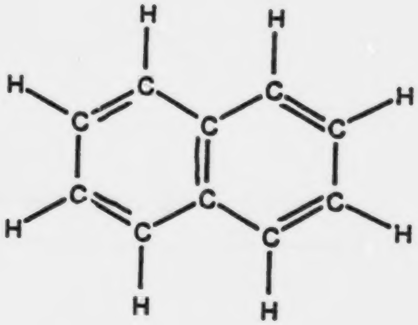


U137: Indeno(1,2,3-c,d)pyrene

Figure 2-1 (continued)



U157: 3-Methylcholanthrene



U165: Naphthalene

Table 2-1 1988 Domestic Manufacturing Capacity for Polynuclear Aromatic Hydrocarbons

Waste code	Name	No. of manufacturers	Capacity (thousand ton/yr)
U005	2,3-Acetylaminofluorene	1	NA
U016	Benz(c)acridine	NA	NA
U018	Benz(a)anthracene	NA	NA
U022	Benzo(a)pyrene	NA	NA
U050	Chrysene	NA	NA
U051	Creosote	NA	NA
U063	Dibenzo(a,h)anthracene	NA	NA
U064	1,2,7,8-Dibenzopyrene	1	NA
U094	7,12-Dimethylbenz(a)anthracene	NA	NA
U120	Fluoranthene	NA	NA
U137	Indeno(1,2,3-c,d)pyrene	NA	NA
U157	3-Methylcholanthrene	1	NA
U165	Naphthalene	4	158

NA - Data not available.
Source: SRI International 1988.

Table 2-2 Principal Uses for Polynuclear Aromatic U-Wastes

Waste code	Name	Uses
U005	2,3-Acetylaminofluorene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis.
U016	Benz(c)acridine	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical.
U018	Benz(a)anthracene	Research chemical (no evidence of commercial use in USA).
U022	Benzo(a)pyrene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical, positive control for laboratory mutagenicity and carcinogenicity studies.
U050	Chrysene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical.
U063	Dibenzo(a,h)anthracene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis.

Table 2-2 (continued)

Waste code	Name	Uses
U064	1,2,7,8-Dibenzopyrene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical; experimental carcinogen.
U094	7,12-Dimethylbenz(a)anthracene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical; used in experimental medicine to induce various malignant tumors in testing antineoplastic drugs.
U120	Fluoranthene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Constituent of coal tar and petroleum-derived asphalt used as lining material to protect interior of steel and ductile iron potable water pipes and storage tanks. Research chemical. In 1977, crude coal tar was widely used in the clinical treatment of acute and chronic dermatoses.
U137	Ideno(1,2,3-c,d)pyrene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Research chemical.
U157	3-Methylcholanthrene	Part of the composition of coal tar, which is used to cover roads, in roofing materials, as a binder for electrodes in the aluminum reduction process, in clinical treatment of skin disorders, in waterproofing, in electrical insulation, pipe coating, and sound insulation, and in organic chemical synthesis. Used experimentally in cancer research, used in research to induce specific forms of cytochrome. Synthesized and used in biochemical research.

Table 2-2 (continued)

Waste code	Name	Uses
U051	Creosote	Antipyretic, styptic, astringent, lubricant for die molds, agent for waterproofing, manufacture of chemicals for veterinary medicine (parasiticide, deodorant), external antiseptic and disinfectant, expectorant in treatment of chronic bronchitis, local anesthetic in dentistry, gastric sedative, and wood preservative.
U165	Naphthalene	Formerly used as wood preservative, manufacture of phthalic and anthranilic acids, naphthols, naphthylamines, sulfonic acid. Manufacture of synthetic resins, celluloid, lampblack, and smokeless powder. Used in the preparation of anthiaquinone. Used for the manufacturer of indigo. Used in formation of perylene via the intermolecular Scholl reaction. Has been developed in Japan for the production of salicyclic acid from naphthalene. Chemical intermediate for 1-naphthyl-n-methyl carbamate insecticide. Chemical intermediate for beta-naphthol and synthetic tanning chemicals. Chemical intermediate for sulfactants, e.g., naphthalene sulfonates. In veterinary medicine, has been used as an insecticide, antiseptic, and vermicide. Used externally on livestock and poultry to control lice. Ingredient of some moth repellants and toilet bowl deodorants. Sulfonation of naphthalene with sulfuric acid powders, i.e., mono-, di-, tri-, and tetranaphthalene sulfuric acids. Manufacture of hydronaphthalenes (tetralin, decalin), which are used as solvents in lubricants, and in motor fuels.

Sources: Merck 1983;
Hazardous Substances Databank, National Library of Medicine 1989.

Table 2-3 Estimated Number of Facilities and Volume of Polynuclear Aromatic U-Wastes Handled in 1986

Waste code	Name	No. of generators	Volume (gal)
U005	2,3-Acetylaminofluorene	1	240
U016	Benz(c)acridine	NA	NA
U018	Benz(a)anthracene	2	240
U022	Benzo(a)pyrene	6	729
U050	Chrysene	1	240
U051	Creosote	13	133,205
U063	Dibenzo(a,h)anthracene	1	1
U064	1,2,7,8-Dibenzopyrene	NA	NA
U094	7,12-Dimethylbenz(a)anthracene	4	252
U120	Fluoranthene	1	1
U137	Indeno(1,2,3-c,d)pyrene	1	1
U157	3-Methylcholanthrene	1	240
U165	Naphthalene	17	84,708

NA - Data not available.
Source: USEPA 1986a.

Table 2-4 Facilities That May Generate Polynuclear Aromatic U-Wastes

Waste code	Description	Facility name	State	Quantity generated
U005	2-Acetylaminofluorene	National Institute of Environmental Health Sciences South	NC	1 ton
U016	Benz(c)acridine	No information available		
U018	Benz(a)anthracene (1,2-Benzanthracene)	E.I. DuPont Experimental Station	DE	1 lb
		National Institute Environmental Health Sciences South	NC	1 ton
U022	Benzo(a)pyrene (3,4-Benzopyrene)	E.I. DuPont Experimental Station	DE	45 lb
		National Institute Environmental Health Sciences South	NC	1 ton
		USDOE Brookhaven National Laboratory	NY	2 gal
		Union Carbide Corporation	NY	2 ton
		USDOE	WA	1 lb
		Aldrich Chem. Co.	WI	1 gal
U050	Chrysene	National Institute Environmental Health Sciences South	NC	1 ton
U151	Creosote	Allied Signal Corp.	AL	9 ton
		Sequoia and Kings Canyon National Park	CA	4 gal
		Koppers Company	GA	1 ton
		USDOE Idaho National Engineering Lab.	ID	5 gal
		Koppers Company	IL	94 ton
		Reilly Tar and Chemical Corp.	IL	124 ton
		Koppers Company Inc.	KY	22 ton
		Clean Harbors of Braintree	MA	66 gal
		Southern Wood Piedmont Company	OH	200 ton
		Koppers Company Inc.	SC	15290 gal
		Rohm & Haas	TX	33 ton
		US Navy Norfolk Naval Base	VA	1 ton
		Koppers Company, Inc.	WI	7 ton

Table 2-4 (continued)

Waste code	Description	Facility name	State	Quantity generated
U063	Dibenzo(a,h)anthracene (1,2,5,6-Dibenzanthracene)	Aldrich Chem. Co.	WI	1 gal
U064	1,2,7,8-Dibenzopyrene	No information available		
U094	7,12-Dimethylbenz(a)-anthracene	National Institute Environmental Health Sciences South	NC	1 ton
		USDOE Brookhaven National Laboratory	NY	11 gal
		USDOE	WA	1 lb
		Aldrich Chem. Co., Inc.	WI	1 gal
U120	Fluoranthene	Aldrich Chem. Co., Inc.	WI	1 gal
U137	Ideno(1,2,3-c,d)pyrene	Aldrich Chem. Co., Inc.	WI	1 gal
U157	3-Methylcholanthrene	National Institute Environmental Health Sciences South	NC	1 ton
U165	Naphthalene	E.I. DuPont	DE	7 lb
		Koppers Company	IL	3080 gal
		American Cyanamid	LA	2 gal
		Watkins Johnson	MD	23 gal
		Dow Chemical	MI	282 ton
		National Institute Environmental Health Sciences South	NC	1 ton
		Monsanto Company	NJ	21 ton
		Diamond Shamrock Chemical	NJ	1 ton
		USDOE Brookhaven National Laboratory	NY	1 gal
		University of Rochester	NY	1 lb
		Rohm and Haas Del Val Inc.	PA	9 ton
		University of Texas	TX	4 lb
		Sterling Chemicals	TX	18 ton
		Nalco Chemicals	TX	NA
		University of Texas	TX	4 ton
		Aldrich Chem. Co., Inc.	WI	1 gal
		Union Carbide	WV	4 ton

NA - data not available.
Source: USEPA 1986a.

Table 2-5 Some Physical and Chemical Characteristics
of Polynuclear Aromatic U-Wastes

Waste code	Name	Chemical formula	Bond dissociation energy[b] (kcal/mole)	Molecular weight	Boiling point[a,c,d,e] (°C)	Solubility in water[c] (mg/l at 25°C)
U005	2-Acetylaminofluorene	$C_{15}H_{13}NO$	3352	223	345	140
U016	Benz(c)acridine	$C_{16}H_{12}N$	3947	229	419	0.035
U018	Benz(a)anthracene	$C_{18}H_{12}$	3775	228	435	$8.8x10^{-3}$
U022	Benzo(a)pyrene	$C_{20}H_{12}$	4142	252	310-312	0.047
U050	Chrysene	$C_{18}H_{12}$	3775	448	488	0.017
U051	Creosote	*	*	*	*	*
063	Dibenzo(a,h)anthracene	$C_{22}H_{14}$	4588	278	447	0.044
U064	1,2,7,8-Dibenzopyrene	$C_{24}H_{14}$	4855	302	483	$1.6x10^{-5}$
U094	7,12-Dimethylbenz(a)-anthracene	$C_{20}H_{16}$	4444	256	477	$1.3x10^{-3}$
U120	Fluoranthene	$C_{16}H_{10}$	3254	202	384	Insoluble
U137	Indeno(1,2,3-c,d)pyrene	$C_{22}H_{12}$	4435	276	162.5-164	$5x10^{5}$
U157	3-Methylcholanthrene	$C_{21}H_{16}$	4515	268	280/80 mm	$1.7x10^{-4}$
U165	Naphthalene	$C_{10}H_{8}$	2735	81	218	30

Sources: [a]Windholz 1983.
[b]Sanderson 1971.
[c]USEPA 1985.
[d]Aldrich Chemical Company 1988.
[e]Dean 1979.
*Creosote contains a mixture of naphthalene, pentachlorophenol, phenanthrene, pyrene, toluene, and xylene(s).

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

This section identifies the treatment technologies that are applicable to the group of polynuclear aromatic U-wastes and determines which, if any, of the applicable technologies can be considered demonstrated for the purpose of establishing best demonstrated available technology.

To be applicable, a technology must be theoretically usable to treat the waste in question, or to treat a waste that is similar in terms of the parameters that affect treatment selection. (For detailed descriptions of the technologies applicable for these wastes, or for wastes judged to be similar, see EPA's Treatment Technology Background Document (USEPA 1988q).) To be demonstrated, the technology must be used in full-scale operation for the treatment of the waste in question or a similar waste. Technologies that are available only at research facilities or at pilot- and bench-scale operations are not considered in identifying demonstrated technologies.

3.1 Applicable Treatment Technologies

The following subsections present applicable treatment technologies for polynuclear aromatic U-wastes (nonwastewaters and wastewaters).

3.1.1 Nonwastewaters

Applicable treatment technologies include those that destroy or reduce the total amount of organic compounds in the waste. Since nonwastewater forms of these wastes will likely contain hazardous organic constituents at treatable concentrations, the Agency has identified the following treatment technologies as applicable for these wastes: (1) incineration (fluidized bed, rotary kiln, and liquid injection);

(2) solvent extraction followed by incineration or recycle of the extract and/or raffinate (residual); (3) critical fluid extraction followed by incineration; (4) wet air oxidation; (5) chemical oxidation; and (6) distillation. An seventh technology, total recycle or reuse, may also be applicable for certain wastes such as off-specification commercial chemical products. These treatment technologies were identified based on current waste treatment practices and engineering judgment. The Agency believes that U051 (creosote) may contain treatable concentrations of metals; therefore, applicable technologies for treatment of metals in nonwastewaters are appropriate for only U051 (creosote). As a result, stabilization has been identified as an applicable technology for metals in U051 nonwastewaters.

Application of these technologies is dependent upon the physical and chemical form of the waste. Many of the wastes may be generated in a variety of forms, as discussed in Section 2. For example, a contaminated soil may be amenable to rotary kiln incineration, while an off-specification liquid chemical product may be amenable to solvent extraction or liquid injection incineration.

ORGANICS TREATMENT

(1) Incineration. Incineration is a destruction technology in which energy, in the form of heat, is transferred to the waste to destabilize chemical bonds and destroy hazardous organic constituents. In a fluidized bed incinerator, waste is injected into the fluidized bed material (generally sand and/or incinerator ash), where it is heated to its ignition temperature. Heat energy from the combustion reactions is then transferred back to the fluidized bed. Ash is removed periodically during operation and during bed change-outs.

In a rotary kiln incinerator, wastes are fed into the elevated end of the kiln, and the rotation of the kiln mixes the waste with hot gases to heat the waste to its ignition temperature. Ash is removed from the lower end of the kiln. Combustion gases from the kiln enter the afterburner for complete destruction of waste constituents. Other wastes may also be injected into the afterburner.

In a liquid injection incinerator, liquid wastes are atomized and injected into the incinerator. In general, only wastes with low or negligible ash content are amenable to liquid injection incineration. Therefore, this technology generally does not result in the generation of an ash residual.

Combustion gases from the incinerator are then fed to a scrubber system for cooling and for removal of entrained particulates and acid gases, if present. In general, with the exception of liquid injection incineration, two residuals are generated by incineration processes: ash and scrubber water.

(2) Solvent extraction. Solvent extraction is a separation technology whereby a contaminant dissolved in a liquid waste is transferred from the waste to an extracting solvent that dissolves that contaminant. For solvent extraction to be effective, the extracting solvent must not be significantly miscible in the waste to be treated and must differ in density so that phase separation is possible. This technology results in the generation of two residuals: a treated waste residual (raffinate) and an extract. The extract and/or raffinate may be recycled or treated by incineration.

(3) Critical fluid extraction. Critical fluid extraction is a solvent extraction technology in which the solvent, which is generally liquified gas at or beyond its critical state, is used to extract hazardous organic constituents from the wastes in the same way as solvent extraction above. After the extraction step, the solvent is brought back to its normal (ambient pressure) condition in the gaseous state,

generating a small volume of extract that is concentrated in hazardous organic constituents. This technology results in the generation of two residuals: a treated waste residue (raffinate) and an extract. The extract may be recycled or treated by incineration; the raffinate can usually be incinerated.

(4) Wet air oxidation. Wet air oxidation is a destruction technology in which hazardous organic constituents in wastes are oxidized and destroyed under pressure at elevated temperatures in the presence of dissolved oxygen. This technology is applicable for wastes composed primarily of water and having up to 10 percent total organic concentration. Wet air oxidation results in the formation of one treatment residual: treated effluent. The treated effluent may require further treatment for hazardous organic constituents by carbon adsorption or other wastewater treatment technologies.

(5) Chemical oxidation. Chemical oxidation is a treatment technology that may be used to treat wastes containing organics and in some cases to treat sulfide and cyanide wastes. The basic principle of chemical oxidation is that some dissolved organic compounds, inorganic cyanides and sulfides are chemically oxidized to yield carbon dioxide, water, salts, simple organic acids; and, in the case of sulfides, sulfates. The principal chemical oxidants used are hypochlorite, chlorine gas, chlorine dioxide, hydrogen peroxide, ozone and potassium permanganate.

(6) Distillation. Distillation is the vaporization of one or more volatile components out of liquid solution by the application of heat. Individual components vaporize in order of their volatility so that relatively pure products result upon condensation of the volatilized components. Volatilized organic products are typically purified and recovered. Nonvolatile residues of less volatile components remain

behind in the distillation vessel bottoms, which are typically incinerated.

(7) Total recycle or reuse. Total recycle or reuse of a waste in the same process or another process eliminates the generation of the waste and generates no treatment residuals.

METALS TREATMENT

Stabilization. Stabilization refers to a broad class of treatment processes that physically or chemically reduce the mobility of hazardous constituents by integrating them into a solid material that is resistant to leaching. Stabilization of organic constituents is usually not very effective. Additionally, organics may inhibit stabilization of metals. Hence, stabilization is applicable to nonwastewater forms of polynuclear aromatic U-wastes only after the organic components have been removed by other treatment, such as incineration.

3.1.2 Wastewaters

Applicable technologies include those that destroy or reduce the total amount of various organic compounds in the waste since wastewater forms of the polynuclear aromatic U-wastes contain hazardous organic constituents at treatable concentrations. The Agency has identified the following treatment technologies as potentially applicable for treatment of these wastes: (1) incineration, (2) wet air oxidation, (3) chemical oxidation, (4) biological treatment, (5) carbon adsorption, (6) solvent extraction, (7) distillation, and (8) steam stripping. A ninth technology, total recycle or reuse, may also be applicable for certain wastewaters. Chemical precipitation has been identified as an applicable treatment technology for U051 (creosote) wastewaters that may contain metals. These treatment technologies were identified based on current waste treatment practices and engineering judgment. Since U051 (creosote) wastewaters may possibly contain treatable concentrations of metals, applicable technologies for treatment of metals in wastewaters, i.e., chemical precipitation and sludge filtration, have been identified only for U051 waste.

Application of these technologies is often dependent upon the concentrations and type(s) of waste constituents present in the waste. Carbon adsorption, for example, is often used as a polishing step following primary treatment by biological treatment, solvent extraction, chemical oxidation or wet air oxidation. Typically, carbon adsorption is applicable for treatment of wastewaters containing less than 0.1 percent total organic concentration. Typically, wet air oxidation, chemical oxidation, biological treatment, and solvent extraction are applicable for treatment of wastewaters containing up to 1 percent total organic concentration.

ORGANICS TREATMENT

(1) **Incineration**. Incineration of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1. EPA believes that incineration may be an applicable wastewater technology for polynuclear aromatic U-waste because incineration typically provides significant destruction (even for wastewaters) and that some of these wastewaters may actually contain high concentrations (near 1 percent total organic carbon (TOC)) of organics. Furthermore, commenters to the Second Third proposed rule, indicated that they were indeed incinerating many wastewaters and they did not want to be precluded from doing so where EPA had proposed carbon adsorption as a method of treatment for wastewater forms of certain U and P organo-phosphorous pesticides.

(2) **Wet air oxidation**. Wet air oxidation of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1.

(3) **Chemical oxidation**. Chemical oxidation of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1.

(4) **Biological treatment**. Biological treatment is a technology that uses living microorganisms to decompose organic constituents. Biological treatment can occur either in the presence of oxygen, known as aerobic treatment, or in the absence of oxygen, referred to as anaerobic treatment. In aerobic treatment the organic constituents are broken down into water, carbon dioxide, and lower molecular weight organic components by the microorganisms. In contrast, in anaerobic treatment, the organic constituents are broken down into water, methane, and other organic components.

(5) **Carbon adsorption**. Carbon adsorption is a separation technology in which hazardous organic constituents in wastewaters are selectively adsorbed onto activated carbon. This technology results in the formation of two treatment residuals: a treated effluent and spent activated carbon.

(6) **Distillation**. Distillation of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1.

(7) **Solvent extraction**. Solvent extraction of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1.

(8) **Steam stripping**. Steam stripping is a technology that can separate more volatile materials from less volatile materials by vaporizing the more volatile materials with live steam and then condensing them. As such, it is a type of distillation process.

(9) Total recycle or reuse. Total recycle or reuse of wastewaters is identical to that of nonwastewaters as described previously in Section 3.1.1.

METALS TREATMENT

Chemical precipitation. Chemical precipitation is used when dissolved metals are to be removed from solution. The underlying principle of chemical precipitation is that metals in wastewaters are removed by the addition of a treatment chemical that converts the dissolved metal to an insoluble metal compound. The insoluble metal compound settles out of solution, leaving a lower concentration of the metal present in the solution. The principal chemicals used to convert soluble metal compounds to less soluble forms include lime ($Ca(OH)_2$), sodium hydroxide (NaOH), sodium sulfide (Na_2S), and, to a lesser extent, soda ash (Na_2CO_3) and ferrous sulfide (FeS).

3.2 Demonstrated Treatment Technologies

The following subsections present demonstrated treatment technologies for polynuclear aromatic nonwastewaters and wastewaters.

3.2.1 Nonwastewaters

ORGANICS TREATMENT

The Agency has identified incineration as a demonstrated technology for treatment of nonwastewater forms of polynuclear aromatic U-wastes. Incineration is demonstrated on a full-scale operational basis for treatment of several of these nonwastewaters as determined from review of the data from many of the treaters of these U-wastes identified in the 1986 TSDR Survey.

From review of the 1986 TSDR Survey and the USEPA Water Engineering Research Laboratory (WERL) data base, the Agency determined that some facilities also treat nonwastewater forms of these wastes or wastes judged to be similar on a full-scale operational basis using wet air oxidation, chemical oxidation, distillation, and stabilization. Therefore, EPA believes that these technologies are demonstrated (being used on a full-scale basis) for these wastes. Since facilities using solvent extraction, critical fluid extraction, and total recycle or reuse were not identified. EPA believes that these technologies are not currently demonstrated for these wastes.

METALS TREATMENT

The Agency has identified stabilization as a demonstrated technology for treatment of metals in U051 (creosote) nonwastewaters. Stabilization has been demonstrated on a full-scale operational basis for treatment of incinerator ash containing metals. EPA believes that this ash would be similar to the ash created by incinerating U051 (creosote) nonwastewaters.

3.2.2 Wastewaters

ORGANICS TREATMENT

From review of the 1986 TSDR Survey and the USEPA Water Engineering Research Laboratory (WERL) data base, the Agency has determined that some facilities treat wastewater forms of polynuclear aromatic U-wastes using incineration, biological treatment, carbon adsorption, wet air oxidation, chemical oxidation, distillation, and steam stripping. Therefore, EPA believes that these technologies are demonstrated for these wastes. Since facilities using critical fluid extraction, solvent extraction, and recycle/reuse were not identified, these technologies are not considered demonstrated.

METALS TREATMENT

The Agency has identified chemical precipitation as a demonstrated technology for treatment of metals in U051 (creosote) wastewaters. Chemical precipitation has been demonstrated on a full-scale operational basis for treatment of many metal-containing wastes that the Agency believes may be similar to U051 (creosote).

4. PERFORMANCE DATA BASE

This section presents the data available on the performance of demonstrated technologies in treating the listed wastes (identified in Tables 1-1 and 1-2). These data are used elsewhere in this document for determining which technologies represent BDAT (Section 4) and for developing proposed treatment standards (Section 5). Eligible data may include data developed at research facilities, or through other applications at less than full-scale operation, as long as the technology is demonstrated in full-scale operation for a similar waste or wastes as defined in Section 2.2.

Performance data for the polynuclear aromatic U-wastes include the untreated waste and treated waste concentrations for each constituent found, the values of operating parameters that were measured at the time the waste was being treated, and the values of relevant design parameters for the treatment technology. Note that these data are for constituents of concern present in F and K wastes and not U-wastes per se. EPA believes that U-wastes may be similar to F and K wastes; therefore, the Agency believes it is valid to use the performance data from F and K wastes to develop the U-waste standards.

Where data are not available on the treatment of the specific constituent of concern, the Agency may elect to transfer performance from the treatment of a similar constituent or waste, using the demonstrated technology. EPA's methodology for the transfer of treatment performance data is provided in EPA's Methodology for Developing BDAT Treatment Standards. To transfer data from another waste category, EPA must find that the wastes covered by this background document are no more difficult to treat (based on the waste characteristics that affect performance of the demonstrated treatment technology) than the treated wastes from which performance data are being transferred.

In developing the treatment standards for the polynuclear aromatic U-wastes, the Agency reviewed the treatability and detection limit data from several different incineration test burns conducted by EPA for various F and K wastes. These data represent a myriad of different hazardous wastes that were generated and treated at several different incineration facilities. (Detection limits data from these various test burns are included in Appendix A of this background document.)

4.1 Nonwastewaters

4.1.1 Organics

The Agency determined that there is substantial treatment data for 7 of the 10 polynuclear aromatic U-wastes for which EPA is proposing a concentration-based standard. The data result from incineration of six particular waste codes: F024 (various wastes from the production of certain halogenated aliphatics such as distillation residues, heavy ends, tars, and reactor cleanout wastes); K001 (bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol (PCP)); K019 (heavy ends from the distillation of ethylene dichloride in ethylene dichloride production); K048 (dissolved air flotation (DAF) float from the petroleum refining industry); K051 (API separator sludge from the petroleum refining industry); and K087 (decanter tank tar sludge from coking operations). Treatment standards for K001, K019, K048, K051, and K087 were promulgated in the First Third final rule on August 8, 1988. Treatment standards for F024 were promulgated in the Second Third final rule on June 8, 1989.

Data from these test burns (i.e., F024, K001, K019, K048, K051, and K087) include information (performance data and/or detection limits) on most of the polynuclear aromatic compounds for which the Agency is proposing concentration-based treatment standards. The waste characterization and performance data for the untreated wastes show concentrations of the polynuclear aromatic constituents ranging from low levels in some wastes to high levels in others (see Appendix A). The Agency believes that these treatment data provide a sufficient range of concentration of polynuclear aromatic chemicals in the untreated wastes and in various nonwastewater matrices to be considered representative of all polynuclear aromatic U-wastes.

After review of all the available treatment performance data for the polynuclear aromatic U-wastes treatability group, the Agency selected the performance data from the incineration of K001, K019, and K087 wastes to develop the proposed treatment standards for the polynuclear aromatic U-wastes (constituents of concern) that were present in the untreated F and K wastes.

For the polynuclear aromatic constituents not present in the untreated F and K wastes, the Agency selected the performance data from waste codes K019, K024, and K087 because among the waste codes containing polynuclear aromatic constituents in the untreated waste (i.e., F024, K001, K048, K051, and K087) K019, K027, and K087 generally had the highest detection limits and highest correction factors (lowest percent recovery). Because of the uncertainty of the concentration of U-waste, the Agency generally selected the highest detection limits to target worst-case scenarios. Additionally, the highest detection limits are more representative of what may be more routinely achievable in the treated residuals.

Details on the selection of performance data used for calculating the proposed standards are explained in Section 6 and presented in Tables 6-1 and 6-2 of this document. Tables 4-1 through 4-17 present the treatment performance data sets for K001, K019, K024, and K087. Appendix A presents the detection limit data for all the F and K waste incineration performance data considered by the Agency for this rulemaking. These Appendix A data also identify when a constituent from the polynuclear aromatics treatability group was present in the F and K wastes.

4.1.2 Metals

The Agency does not have treatment data for the metal constituents of U051 (creosote) nonwastewaters. However, the Agency has data for stabilization of F006 wastewater treatment sludges from electroplating operations (see Table 4-18). The Agency believes that these data are appropriate for determining the proposed metal standards for U051 (creosote) because these data were used to develop the metals standard for K001 creosote waste, which is likely to be similar to U051 creosote waste.

4.2 Wastewaters

4.2.1 Organics

The treatment data available to the Agency for determination of the proposed organics wastewater standards are identical to the data identified in Section 4.1.1. These data are also presented in Tables 4-1 through 4-17 at the end of this section.

As discussed in detail in Section 1 of this document and reiterated here, the Agency is also currently analyzing performance data primarily from EPA's Office of Water's data base. These data include the treatment of wastewaters that are not specifically listed as U or P wastewaters, but do contain many of the corresponding U or P constituents. While these data were not available in time to incorporate into the preamble discussion or into this background document, these data are being placed in the administrative record for this Third Third rulemaking.

Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for all U and P wastewaters for which standards based on incinerator scrubber waters concentrations have been proposed. Further information on these alternative standards can be found in sections III.A.2.a.(3) and III.A.1.h.(b.) of the preamble for the proposed rule and in the document "Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents" that can be found in the RCRA docket.

The Agency is also in the process of conducting wastewater treatment tests for selected U and P chemicals using wet air oxidation, powdered activated carbon treatment (PACT), and carbon adsorption. Since much of the currently available wastewater treatment data is from the treatment of relatively low concentrations of U and P constituents in industrial wastewaters, these tests have been designed to examine the applicability of treatment technologies to wastewaters containing relatively high concentrations of U and P constituents. The data developed in these studies will be placed in the administrative record for inspection and comment, when they become available. Further information on the availability of the forthcoming wastewater treatment test data can be found in section III.A.1.h.(6.) of the preamble for the proposed rule.

4.2.2 Metals

The Agency does not have treatment data for the metal constituents of U051 (creosote) wastewaters. However, the Agency has performance data from chemical precipitation followed by sludge filtration of a mixed waste sampled by EPA at Envirite Company (see Table 4-19). The Agency believes that these data are appropriate for the U051 (creosote) wastewater standards as the Agency has used these data to develop standards in the First and Second Third rulemaking.

Table 4-1 Treatment Performance Data for Rotary Kiln Incineration of K001

K001 (Creosote)

Sample Set No. 1

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	56	<10	<0.010
Toluene	110	<10	<0.010
Ethyl benzene	57	<10	<0.010
Xylenes	120	<10	<0.010
Semivolatile Organics			
Acenaphthene	21,000	<0.13	<0.004
Anthracene	15,000	<0.13	<0.002
Chrysene	4,800	<0.17	<0.003
Fluorene	18,000	<0.13	<0.002
Naphthalene	42,000	<0.11	<0.002
Phenanthrene	41,000	<0.36	<0.006
Phenol	2,400	<0.10	<0.002
Pyrene	17,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 1

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash)		Treated wastewater (scrubber water) (mg/l)
		Total (mg/kg)	TCLP (mg/l)	
Metals				
Antimony	<3.4	<3.4	0.035	<0.034
Arsenic	2.6	5.3	<0.004	0.041
Barium	63	81	0.38	0.76
Beryllium	<0.1	<0.1	<0.001	0.002
Cadmium	3.4	<0.4	0.004	0.87
Chromium	5.0	6.1	<0.007	0.35
Copper	35	86	0.020	0.42
Mercury	0.35	<0.25	<0.0005	0.016
Nickel	2.1	3.6	<0.015	0.48
Lead	170	<4.2	<0.042	2.5
Selenium	1.5	2.3	<0.004	0.057
Silver	<0.7	<0.7	<0.007	<0.035
Thallium	7.7	<0.5	<0.005	<0.028
Vanadium	<4.0	4.4	<0.008	0.040
Zinc	170	1.9	0.020	5.0

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 2

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	60	<10	<0.010
Toluene	120	<10	<0.010
Ethyl benzene	56	<10	<0.010
Xylenes	130	<10	<0.010
Semivolatile Organics			
Acenaphthalene	1,000	<0.13	<0.004
Acenaphthene	15,000	<0.13	<0.002
Anthracene	7,300	<0.13	<0.002
Chrysene	4,200	<0.17	<0.003
Fluorene	12,000	<0.13	<0.002
Naphthalene	40,000	<0.11	<0.002
Phenanthrene	32,000	<0.36	<0.002
Phenol	3700	<0.10	<0.006
Pyrene	13,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 2

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) Total (mg/kg)	Treated nonwastewater (ash) TCLP (mg/l)	Treated wastewater (scrubber water) (mg/l)
Metals				
Antimony	<3.4	<3.4	<0.034	<0.034
Arsenic	<0.4	5.3	<0.004	0.15
Barium	58	74	0.57	0.80
Beryllium	<0.1	<0.1	<0.001	<0.001
Cadmium	3.4	<0.4	<0.004	0.99
Chromium	4.8	5.3	<0.007	0.74
Copper	32	100	0.030	0.50
Mercury	0.35	<0.25	<0.0005	0.060
Nickel	<1.5	4.6	<0.015	0.51
Lead	160	<4.2	<0.042	4.5
Selenium	1.4	1.9	<0.004	0.11
Silver	<0.7	<0.7	<0.007	0.010
Thallium	8.0	<0.5	<0.005	2.4
Vanadium	<0.8	4.1	<0.008	0.060
Zinc	170	1.8	0.050	7.1

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 3

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	61	<10	<0.010
Toluene	100	<10	<0.010
Ethyl benzene	55	<10	<0.010
Xylenes	120	<10	<0.010
Semivolatile Organics			
Acenaphthene	19,000	<0.13	<0.004
Anthracene	12,000	<0.13	<0.002
Chrysene	4,800	<0.17	<0.003
Fluorene	16,000	<0.13	<0.002
Naphthalene	40,000	<0.11	<0.002
Phenanthrene	37,000	<1.36	<0.006
Phenol	3,600	<0.10	<0.002
Pyrene	16,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 3

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash)		Treated wastewater (scrubber water) (mg/l)
		Total (mg/kg)	TCLP (mg/l)	
Metals				
Antimony	<3.4	<3.4	0.040	<3.4
Arsenic	2.1	9.0	<0.004	0.16
Barium	70	61	0.53	0.56
Beryllium	<0.1	<0.1	<0.001	0.001
Cadmium	3.1	<0.4	<0.004	0.95
Chromium	6.4	5.8	<0.007	0.60
Copper	39	98	0.030	0.43
Mercury	<0.25	<0.25	<0.0005	0.008
Nickel	2.1	5.0	0.020	0.56
Lead	150	<4.2	<0.042	3.5
Selenium	1.2	1.8	<0.004	0.090
Silver	<0.7	<0.7	<0.007	0.010
Thallium	6.8	<0.5	<0.005	2.8
Vanadium	<0.8	4.1	<0.008	0.040
Zinc	160	3.2	0.080	9.1

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 4

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	51	<0.10	<0.010
Toluene	110	<0.10	<0.010
Ethyl benzene	72	<0.10	<0.010
Xylenes	130	<0.10	<0.010
Semivolatile Organics			
Acenaphthene	16,000	<0.13	<0.004
Anthracene	8,500	<0.13	<0.002
Chrysene	4,100	<0.17	<0.003
Fluorene	14,000	<0.13	<0.002
Naphthalene	32,000	<0.11	<0.002
Phenanthrene	29,000	<0.36	<0.006
Phenol	3,900	<0.10	<0.002
Pyrene	12,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 4

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) Total (mg/kg)	Treated nonwastewater (ash) TCLP (mg/l)	Treated wastewater (scrubber water) (mg/l)
Metals				
Antimony	<3.4	<3.4	0.040	0.040
Arsenic	2.5	10	<0.004	0.28
Barium	59	48	0.31	1.0
Beryllium	<0.1	<0.1	<0.001	0.001
Cadmium	2.4	<0.4	<0.004	1.2
Chromium	7.0	8.7	<0.007	1.0
Copper	39	110	<0.006	0.51
Mercury	0.40	<0.25	<0.0005	0.29
Nickel	2.8	5.2	<0.015	0.60
Lead	110	<4.2	<0.042	5.4
Selenium	1.1	2.5	<0.004	0.12
Silver	<0.7	<0.7	<0.007	0.020
Thallium	5.3	<0.5	<0.005	3.4
Vanadium	0.82	0.8	<0.008	0.080
Zinc	120	2.8	0.010	11

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 5

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	58	<0.10	<0.010
Toluene	110	<0.10	<0.010
Ethyl benzene	71	<0.10	<0.010
Xylenes	130	<0.10	<0.010
Semivolatile Organics			
Acenaphthene	19,000	<0.13	<0.004
Anthracene	7,400	<0.13	<0.002
Chrysene	4,200	<0.17	<0.003
Fluorene	16,000	<0.13	<0.002
Naphthalene	29,000	<0.11	<0.002
Phenanthrene	32,000	<0.36	<0.006
Phenol	2,400	<0.10	<0.002
Pyrene	15,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 5

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) Total (mg/kg)	Treated nonwastewater (ash) TCLP (mg/l)	Treated wastewater (scrubber water) (mg/l)
Metals				
Antimony	<3.4	<3.4	0.040	<0.040
Arsenic	0.7	13	0.025	0.25
Barium	12	56	0.22	0.90
Beryllium	<0.1	<0.1	<0.001	0.002
Cadmium	0.79	<0.4	<0.004	0.45
Chromium	1.6	10	<0.007	0.65
Copper	12	130	0.008	0.45
Mercury	0.79	<0.25	<0.0005	0.19
Nickel	1.8	6.8	<0.015	0.70
Lead	37	<4.2	<0.042	3.3
Selenium	0.3	2.6	0.004	0.038
Silver	<0.7	<0.7	<0.007	0.010
Thallium	2.2	<0.5	<0.005	3.8
Vanadium	<0.8	5.2	0.020	0.050
Zinc	40	3.0	0.030	8.2

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 6

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Benzene	83	<0.10	<0.010
Toluene	170	<0.10	<0.010
Ethyl benzene	87	<0.10	<0.010
Xylenes	170	<0.10	<0.010
Semivolatile Organics			
Acenaphthene	17,000	<0.13	<0.004
Anthracene	9,100	<0.13	<0.002
Chrysene	4,300	<0.17	<0.003
Fluorene	14,000	<0.13	<0.002
Naphthalene	43,000	<0.11	<0.002
Phenanthrene	36,000	<0.36	<0.006
Phenol	3,300	<0.10	<0.002
Pyrene	13,000	<0.13	<0.002

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (Creosote)

Sample Set No. 6

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) Total (mg/kg)	Treated nonwastewater (ash) TCLP (mg/l)	Treated wastewater (scrubber water) (mg/l)
Metals				
Antimony	<3.4	<3.4	0.040	0.040
Arsenic	2.6	11	<0.004	1.6
Barium	150	72	0.41	1.1
Beryllium	<0.1	<0.1	<0.001	0.001
Cadmium	3.5	<0.4	<0.004	0.46
Chromium	8.6	7.7	<0.007	0.89
Copper	38	86	0.070	0.35
Mercury	0.64	<0.25	<0.0005	0.54
Nickel	4.5	3.9	0.020	0.54
Lead	190	<4.2	<0.042	3.9
Selenium	1.1	2.8	<0.004	0.021
Silver	<0.7	<0.7	<0.007	0.020
Thallium	3.3	<0.5	<0.005	4.0
Vanadium	1.9	4.8	<0.008	0.060
Zinc	200	2.5	0.002	8.2

Source: Radian Corp. 1987.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 7

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Toluene	16	<2	<0.002
Semivolatile Organics			
Acenaphthene	13,000	<0.5	<0.010
Anthracene	9,300	<0.5	<0.010
Benzo(b &/or k) fluoroanthrene	940	<0.5	<0.010
Fluoranthrene	13,000	<0.5	<0.010
Fluorene	8,200	<0.5	<0.010
Naphthalene	26,000	<0.5	<0.010
Pentachlorophenol	970	<2.5	<0.050
Phenanthrene	28,000	<0.5	<0.010
Pyrene	9,200	<0.5	<0.010

Source: USEPA 1987b.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 7

BDAT List Constituent	Untreated waste (mg/kg)	Treated nonwastewater Total (mg/kg)	Treated nonwastewater TCLP (mg/l)	Treated wastewater (mg/l)
Metals				
Antimony	<6.0	<6.0	<0.06	<0.06
Arsenic	2.9	0.8	<0.003	<0.002
Barium	30	74	0.32	0.12
Beryllium	<0.1	<0.1	<0.001	<0.001
Cadmium	0.5	<0.3	<0.003	<0.003
Chromium	1.5	8.2	<0.009	<0.009
Copper	6.7	6.8	<0.01	0.15
Lead	7.8	5.2	0.021	0.021
Mercury	0.11	<0.0002	<0.0002	<0.0002
Nickel	<2.0	<2.0	<0.02	<0.02
Selenium	<0.5	<0.5	<0.005	<0.005
Silver	<0.9	<0.9	<0.009	<0.009
Thallium	<0.3	<0.3	<0.01	<0.01
Vanadium	<2.0	<2.0	<0.02	<0.02
Zinc	64	11	<0.006	1.1

Source: USEPA 1987b.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 8

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Toluene	10	<2	<0.002
Semivolatile Organics			
Acenapthene	18,000	<0.5	<0.010
Anthracene	13,000	<0.5	<0.010
Benz(a)anthracene	3,400	<0.5	<0.002
Benzo(a)pyrene	940	<0.5	<0.010
Benzo(b &/or k) fluoranthrene	2,300	<0.5	<0.010
Chrysene	3,600	<0.5	<0.010
Fluoranthrene	21,000	<0.5	<0.010
Fluorene	12,000	<0.5	<0.010
Naphthalene	43,000	<0.5	<0.010
Pentachlorophenol	3,000	<2.5	<0.050
Phenanthrene	42,000	<0.5	<0.010
Pyrene	15,000	<0.5	<0.010

Source: USEPA 1987b.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 8

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater		Treated wastewater (mg/l)
		Total (mg/kg)	TCLP (mg/l)	
Metals				
Antimony	<6.0	<6.0	<0.06	<0.06
Arsenic	2.3	0.6	<0.003	0.12
Barium	19	21	0.19	0.24
Beryllium	<0.1	<0.1	<0.001	<0.001
Cadmium	0.6	<0.3	<0.003	<0.003
Chromium	2.7	1.1	<0.009	<0.009
Copper	11	3.0	<0.01	0.09
Lead	11	1.2	<0.01	0.18
Mercury	0.16	<0.0002	<0.0002	<0.0002
Nickel	<2.0	<2.0	<0.02	<0.02
Selenium	<0.5	<0.5	<0.005	<0.005
Silver	<0.9	<0.9	<0.009	<0.009
Thallium	<0.3	<0.3	<0.01	<0.01
Vanadium	<2.0	<2.0	<0.02	<0.02
Zinc	58	2.1	<0.006	0.61

Source: USEPA 1987b.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 9

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater (ash) (mg/kg)	Treated wastewater (scrubber water) (mg/l)
Volatile Organics			
Toluene	39	<2	<0.002
Semivolatile Organics			
Acenapthene	14,000	<0.5	<0.010
Anthracene	8,500	<0.5	<0.010
Benz(a)anthracene	2,500	<0.5	<0.001
Benzo(a)pyrene	620	<0.5	<0.010
Benzo(b &/or k) fluroanthrene	1,600	<0.5	<0.010
Fluoranthrene	15,000	<0.5	<0.010
Fluorene	9,000	<0.5	<0.010
Naphthalene	37,000	<0.5	<0.010
Pentachlorophenol	920	<2.5	<0.050
Phenanthrene	32,000	<0.5	<0.010
Pyrene	11,000	<0.5	<0.010

Source: USEPA 1987b.

Table 4-1 (continued)

K001 (PCP)

Sample Set No. 9

BDAT list constituent	Untreated waste (mg/kg)	Treated nonwastewater Total (mg/kg)	Treated nonwastewater TCLP (mg/l)	Treated wastewater (mg/l)
Metals				
Antimony	<6.0	<6.0	<0.06	<0.06
Arsenic	1.1	0.4	<0.003	0.11
Barium	17	21	0.25	0.39
Beryllium	<0.1	<0.1	<0.001	<0.001
Cadmium	0.4	<0.3	<0.003	<0.003
Chromium	2.1	1.2	<0.009	0.045
Copper	10	2	<0.01	0.07
Lead	6.3	0.96	<0.002	0.20
Mercury	0.064	<0.0002	<0.0002	0.003
Nickel	<2.0	<2.0	<0.02	<0.02
Selenium	<0.5	<0.5	<0.005	<0.005
Silver	<0.9	<0.9	<0.009	<0.009
Thallium	<0.3	<0.3	<0.01	<0.01
Vanadium	<2.0	<2.0	<0.02	<0.02
Zinc	30	2.1	<0.006	0.88

Source: USEPA 1987b.

Table 4-2 Incinerator Operating Data for K001 - Creosote Sample Sets 1 through 6

Parameter	Sample collected	K001-creosote feed rate (lb/h)	Temperature (°F)		Kiln rotation speed (rpm)	Stack gas concentrations		
			Kiln	Afterburner		O_2 (%)	CO (ppm)	CO_2 (%)
10/5/87								
Kiln shakedown (before K001-C feed)	Scrubber pretest water	0	1720-1917	1984-2019	0.25			
10/6/87								
Start feed 11:03		180			0.25			
Begin test 12:10	Feed[a]	180	1694-1873	1932-2016	0.25	4-9	12-27	8-12
12:30		180	1771-1886	2008-2031	0.25	4-12	22-32	3-11
13:00		180	1828-1863	2014-2031	0.25	4-20	18-33	5-12
13:30		180	1835-1874	2014-2035	0.25	5-8	30-34	1-11
13:40	Ash Recycle[b]	180	1835-1838	2030-2033	0.25	6-8	32-34	9-10
14:00	Feed[a]	180	1790-1860	1996-2033	0.25	5-9	32-37	8-11
14:30		180	1800-1913	1996-2034	0.25	5-8	32-37	9-11
15:00		180	1838-1906	2019-2035	0.25	6-8	34-37	8-11
15:25	Ash Recycle[b]	180	1795-1838	2006-2019	0.25	7-9	30-37	8-10

[a] The feed samples were collected while the fiber packs were being packed. Six drums were used for the 2 days of testing. K001 creosote waste from two drums was incinerated for each sample set.

[b] The scrubber recycle tank was not blown down during the test series. Makeup water was added to replace water lost through the exhaust system. No chemicals were added to the scrubber water system. The recycle water samples were taken from the scrubber recirculation line.

Reference: USEPA 1987b.

Table 4-2 (continued)

Parameter		Sample collected	K001-creosote feed rate (lb/h)	Temperature, (°F)		Kiln rotation speed (rpm)	Stack gas concentrations		
				Kiln	Afterburner		O_2 (%)	CO (ppm)	CO_2 (%)
10/6/87									
Continued feed									
	17:10	Feed[a]	180			0.25			
	17:30		180	1775-1840	1985-2002	0.25	6-10	39-42	8-10
	18:00		180	1827-1875	2002-2026	0.25	6-9	31-42	8-11
	18:30		180	1827-1875	2007-2026	0.25	6-9	39-41	8-10
	18:40	Ash	180	1822-1871	1993-2009	0.25	7-9	39-41	8-9
		Recycle[b]							
	19:00	Feed[a]	180	1819-1826	1993-1997	0.25	7-9	37-41	8-10
	19:30		180	1825-1878	1997-2008	0.25	7-9	31-42	8-11
	20:00	Recycle[b]	180	1859-2028	1995-2093	0.25	4-9	39-720	8-13
	20:15	Ash	180	1824-1859	1986-1995	0.25	7-10	35-38	8-10

[a] The feed samples were collected while the fiber packs were being packed. Six drums were used for the 2 days of testing. K001 creosote waste from two drums was incinerated for each sample set.

[b] The scrubber recycle tank was not blown down during the test series. Makeup water was added to replace water lost through the exhaust system. No chemicals were added to the scrubber water system. The recycle water samples were taken from the scrubber recirculation line.

Reference: USEPA 1987b.

Table 4-2 (continued)

Parameter	Sample collected	K001-creosote feed rate (lb/h)	Temperature, (°F)		Kiln rotation speed (rpm)	Stack gas concentrations		
			Kiln	Afterburner		O_2 (%)	CO (ppm)	CO_2 (%)
10/7/87								
Start feed 11:00		180			0.25			
Begin test 11:30	Feed[a]	180	1806-1841	2012-2020	0.25	4-8	15-18	9-12
12:00		180	1823-1912	2017-2039	0.25	2-9	15-30	9-13
12:30	Ash Recycle[b]	180	1830-1886	2019-2025	0.25	4-8	17-24	9-11
13:00	Feed[a]	180	1845-1910	2011-2025	0.25	5-9	19-25	9-10
13:30		180	1829-1845	1999-2011	0.25	6-9	18-22	9-10
14:00		180	1827-1838	1997-2009	0.25	7-9	18-22	9-10
14:30		180	1827-1857	1999-2022	0.25	7-9	15-23	9-10
14:45	Ash Recycle[b]	180	1844-1899	2022-2034	0.25	5-8	22-25	9-10
15:00		180	1896-1900	2026-2033	0.25	5-9	22-25	9-11

[a] The feed samples were collected while the fiber packs were being packed. Six drums were used for the 2 days of testing. K001 creosote waste from two drums was incinerated for each sample set.

[b] The scrubber recycle tank was not blown down during the test series. Makeup water was added to replace water lost through the exhaust system. No chemicals were added to the scrubber water system. The recycle water samples were taken from the scrubber recirculation line.

Reference: USEPA 1987b.

Table 4-3 Incinerator Operating Data for K001-PCP
Sample Sets 7 through 9

Parameter	Sample collected	Temperature (°F)		Kiln rotation speed (rpm)	Stack gas concentrations		
		Kiln	Afterburner		02 (%)	CO (ppm)	CO_2 (%)
6/26/87							
Start feed (86 lb/h)	Feed[a]						
drum #1 15:30	Makeup water						
15:45							
16:00		1650-1682	1840-1869	0.2	5-9	<1	4->10
16:15		1720-1803	1823-1866	0.2	5-8	<1	7->10
16:30		1767-1826	1869-1875	0.2	5-9	<1	6->10
16:45		1777-1820	1872-1879	0.2	6-8	<1	8-10
17:00		1801-1873	1876-1895	0.2	5-8	<1	9->10
17:15		1813-1899	1889-1903	0.2	4-9	<1	8->10
17:30		1793-1936	1890-1914	0.2	4-9	<1	8->10
17:45		1861-1914	1885-1912	0.2	6-8	<1	9->10
18:00		1823-1914	1868-1888	0.2	5-16	<1	9->10
18:15		1782-1892	1859-1871	0.2	4-16	<1	9->10
18:30[b]		1877	1839	0.2	3-8	<1	8->10
18:45[b]		1924	1846	0.2	3-8	<1	8->10
19:00[b]		1970	1857	0.2	3-9	<1	8->10
19:15[b]	Blowdown ash[c]	2046	2033	0.2	3-10	<1	8->10

[a] The feed samples were collected while the fiber packs were being packed.

[b] Only one temperature value was available during this time period.

[c] The ash samples were collected from the ash bin after the ash had cooled.

Reference: USEPA 1987b.

Table 4-4

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Wast Kiln Ash Concentratio mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	3,000	<8	<2
14. Chloroform	4,600	<8	<2
22. 1,1-Dichloroethane	2,200	<8	<2
23. 1,2-Dichloroethane	93,000	<8	<2
34. Methyl ethyl ketone	<1,000	<8	<2
38. Methylene chloride	<1,000	940	<10
42. Tetrachloroethene	7,300	910	<10
43. Toluene	<200	490	<2
45. 1,1,1-Trichloroethane	81,000	2,300	<2
47. Trichloroethene	3,210	130	<2
215-217. Xylene (total)	<200	360	<2
222. Acetone	<1,000	3,400	<2
226. Ethyl benzene	<200	1,200	<10
229. Methyl isobutyl ketone	<1,000	2,200 1,100	<2 <10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	81	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	20	53	<2
110. Hexachlorobenzene	69	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019 PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1 (Continued)

	Untreated Waste		Treated Waste	
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln A TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	120	<100	<10	
121. Naphthalene	470	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	61	<100	<10	
141. Phenanthrene	21	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	76	<50	<5	
150. 1,2,4-Trichlorobenzene	100	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	8.0	<0.060
155. Arsenic	1.2	94	3.6	<0.002
156. Barium	0.97	1.3	26	0.033
158. Cadmium	0.63	<0.3	0.66	<0.003
159. Chromium	4.0	40	44	0.200
160. Copper	2.1	165	2,370	2.690
161. Lead	3.4	27	120	0.380
163. Nickel	3.0	8.8	66	0.680
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	4.1	<0.020
168. Zinc	5.8	4,170	12	0.052
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	38	
171. Sulfide	790	830	68	

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (^{o}F)	*	1825-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 13.1 RCRA Blend, Waste Burner #1: 3.9-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

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*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln As TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	85	<100	<10	
121. Naphthalene	314	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	51	<100	<10	
141. Phenanthrene	15	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	62	<50	<5	
150. 1,2,4-Trichlorobenzene	65	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	6.8	<0.060
155. Arsenic	<0.2	94	2.8	<0.002
156. Barium	<0.9	1.3	23	0.036
158. Cadmium	0.46	<0.3	0.96	0.004
159. Chromium	3.4	40	60	0.130
160. Copper	1.7	165	3,430	2.380
161. Lead	2.3	27	42	0.260
163. Nickel	3.6	8.8	89	0.560
165. Silver	<0.9	<0.9	3.4	<0.009
167. Vanadium	<2.0	2.2	4.8	<0.020
168. Zinc	6.9	4,170	13	0.07
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	5.1	
171. Sulfide	NA	830	<50	

NA Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)	*	1800-1880
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 12.2 RCRA Blend, Waste Burner #1: 5.2-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3

	Untreated Waste		Treated Wast
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentratio mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,500	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	87,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,000	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	34,000	130	<2
47. Trichloroethene	2,200	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	290	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	80	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	73	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3 (Continued)

	Untreated Waste		Treated Waste	
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	95	<100	<10	
121. Naphthalene	350	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	59	<100	<10	
141. Phenanthrene	11	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	67	<50	5	
150. 1,2,4-Trichlorobenzene	70	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.2	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	54	0.057
158. Cadmium	0.53	<0.3	3.6	0.005
159. Chromium	3.5	40	202	0.260
160. Copper	1.7	165	2,290	7.030
161. Lead	3.4	27	118	0.620
163. Nickel	2.3	8.8	169	0.960
165. Silver	<0.9	<0.9	1.9	<0.009
167. Vanadium	<2.0	2.2	6.0	<0.020
168. Zinc	4.4	4,170	16	0.170
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	6.1	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (^{o}F)	*	1850-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 12.4 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-8.4
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4

	Untreated Waste		Treated Wast
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentratio mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,900	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,300	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	122,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,200	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene .	2,300	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	310	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	12
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	84	32	<2
98. Di-n-butyl phthalate	<10	31	230
108. Fluoranthene	<10	120	<2
109. Fluorene	21	53	<2
110. Hexachlorobenzene	61	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4 (Continued)

	Untreated Waste		Treated Waste	
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln As TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	94	<100	<10	
121. Naphthalene	360	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	64	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	82	<50	<5	
150. 1,2,4-Trichlorobenzene	74	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	<6.0	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	8.4	0.036
158. Cadmium	<0.3	<0.3	<0.3	0.005
159. Chromium	1.8	40	28	0.110
160. Copper	<1.0	165	1,270	1.940
161. Lead	2.4	27	25	0.320
163. Nickel	2.2	8.8	69	0.870
165. Silver	<0.9	<0.9	2.6	<0.009
167. Vanadium	<2.0	2.2	<2.0	<0.020
168. Zinc	9.4	4,170	11	0.056
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	3.2	
171. Sulfide	NA	830	<50	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019 PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (^{o}F)	*	1775-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 12.7 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-7.3
Kiln Rotational Speed (RPM)	*	0.19-0.21

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*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Was Kiln Ash Concentrati mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	6,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	130,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,800	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	45,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	340	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	87	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln As TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	113	<100	<10	
121. Naphthalene	371	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	63	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	73	<50	<5	
150. 1,2,4-Trichlorobenzene	72	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.1	<0.060
155. Arsenic	<0.2	94	3.9	<0.002
156. Barium	<0.9	1.3	21	0.054
158. Cadmium	0.36	<0.3	1.2	0.006
159. Chromium	3.2	40	125	0.210
160. Copper	2.1	165	2,780	2.140
161. Lead	2.5	27	86	0.290
163. Nickel	4.8	8.8	166	1.270
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	5.7	<0.020
168. Zinc	4.7	4,170	22	0.086
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	23	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)	*	1775-1800
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 11.7 RCRA Blend, Waste Burner #1: 5.5-6.0 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

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*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	 RCRA Blend* Concentration mg/kg (ppm)	Treated Wast Kiln Ash Concentratio mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,100	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,600	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	98,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,900	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenapthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	330	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	22	53	<2
110. Hexachlorobenzene	66	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6 (Continued)

	Untreated Waste		Treated Waste	
Detected BDAT List Organic Constituents	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)	Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	88	<100	<10	
121. Naphthalene	390	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	65	<100	<10	
141. Phenanthrene	17	240	<2	
142. Phenol	<10	7.8	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	86	<50	<5	
150. 1,2,4-Trichloroenzene	79	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.6	< 0.06
155. Arsenic	<0.2	94	2.3	<0.002
156. Barium	<0.9	1.3	11	0.027
158. Cadmium	0.62	<0.3	2.2	0.006
159. Chromium	5.3	40	141	0.092
160. Copper	3.6	165	2,520	2.400
161. Lead	3.5	27	34	0.270
163. Nickel	6.0	8.8	288	0.690
165. Silver	<0.9	<0.9	3.1	<0.009
167. Vanadium	<2.0	2.2	8.7	<0.020
168. Zinc	8.4	4,170	13	0.061
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	4.7	
171. Sulfide	NA	830	92	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)	*	1775-1850
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)	*	K019: 11.5 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002
9. Chlorobenzene	3,000	<8	<2,000	<0.4	<0.002
14. Chloroform	4,600	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<200	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	2,200	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	93,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<1,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<1,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,300	490	<2,000	<0.4	<0.002
43. Toluene	<200	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	81,000	130	<2,000	2.3	<0.002
47. Trichloroethene	3,210	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<200	3,400	36,000	4.4	<0.002
222. Acetone	<1,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<200	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<1,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	280	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	81	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	<0.002
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	20	53	340	<0.002	<0.002
110. Hexachlorobenzene	69	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	120	<100	<500	0.018	<0.010
121. Naphthalene	470	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	61	<100	1,000	0.020	<0.010
141. Phenanthrene	21	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	76	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	100	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration: K019 mg/kg (ppm)	Untreated Waste Concentration: RCRA Blend* mg/kg (ppm)	Untreated Waste Concentration: PCB Blend* mg/kg (ppm)	Untreated Waste Concentration: Mercaptan-Contaminated Waste* mg/L (ppm)	Treated Waste: Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.41
155. Arsenic	1.2	94	7.4	<0.020	0.046
156. Barium	0.97	1.3	<19	1.670	0.48
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.63	<0.3	<33	<0.003	0.23
159. Chromium	4.0	40	23.7	<0.009	0.11
160. Copper	2.1	165	107	0.027	1.81
161. Lead	3.4	27	<7.3	0.0064	0.82
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.002
163. Nickel	3.0	8.8	6.2	0.037	0.081
165. Silver	<0.9	<0.9	<18	0.018	0.085
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16
168. Zinc	5.8	4,170	6810	0.071	11.4
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	20.0
171. Sulfide	790	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019 PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (^{o}F)	*	2380
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 36.1 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		6.8
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5. (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste Concentration: K019 mg/kg (ppm)	Untreated Waste Concentration: RCRA Blend* mg/kg (ppm)	Untreated Waste Concentration: PCB Blend* mg/kg (ppm)	Untreated Waste Concentration: Mercaptan-Contaminated Waste* mg/L (ppm)	Treated Waste: Sqrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,8[illegible]	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,800	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	96,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.010
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.010
42. Tetrachloroethene	6,700	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0032
45. 1,1,1-Trichloroethane	33,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,400	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	280	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Sqrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	74	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0063
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	16	53	340	<0.002	<0.002
110. Hexachlorobenzene	60	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	85	<100	<500	0.018	<0.010
121. Naphthalene	314	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	51	<100	1,000	0.020	<0.010
141. Phenanthrene	15	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	62	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	65	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Treated Waste Sqrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.39
155. Arsenic	<0.2	94	7.4	<0.020	0.038
156. Barium	<0.9	1.3	<19	1.670	0.50
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.46	<0.3	<33	<0.003	0.19
159. Chromium	3.4	40	23.7	<0.009	0.14
160. Copper	1.7	165	107	0.027	1.38
161. Lead	2.3	27	<7.3	0.0064	0.78
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0026
163. Nickel	3.6	8.8	6.2	0.037	0.068
165. Silver	<0.9	<0.9	<18	0.018	0.095
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.18
168. Zinc	6.9	4,170	6810	0.071	11.0
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	15.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019 PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (^{o}F)	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,500	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5.000	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.0043
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	87,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	6,000	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0026
45. 1,1,1-Trichloroethane	34,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,200	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	290	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

*Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration: K019 mg/kg (ppm)	Untreated Waste Concentration: RCRA Blend* mg/kg (ppm)	Untreated Waste Concentration: PCB Blend* mg/kg (ppm)	Untreated Waste Concentration: Mercaptan-Contaminated Waste* mg/L (ppm)	Treated Waste: Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	80	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0046
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	19	53	340	<0.002	<0.002
110. Hexachlorobenzene	73	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	95	<100	<500	0.018	<0.01
121. Naphthalene	350	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	59	<100	1,000	0.020	<0.010
141. Phenanthrene	11	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	67	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	70	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.41
155. Arsenic	<0.2	94	7.4	<0.02	0.030
156. Barium	<0.9	1.3	<19	1.670	0.530
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.53	<0.3	<33	<0.003	0.150
159. Chromium	3.5	40	23.7	<0.009	0.13
160. Copper	1.7	165	107	0.027	1.18
161. Lead	3.4	27	<7.3	0.0064	0.64
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0015
163. Nickel	2.3	8.8	6.2	0.037	0.057
165. Silver	<0.9	<0.9	<18	0.018	0.0092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.150
168. Zinc	4.4	4,170	6810	0.071	9.50
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	14.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Arochlor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (°F)	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		7.2
Carbon Monoxide Concentration (ppm volume)		0

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,900	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,300	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.014
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	122,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,200	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0046
45. 1,1,1-Trichloroethane	44,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,300	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	310	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Sorubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	84	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0042
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	21	53	340	<0.002	<0.002
110. Hexachlorobenzene	61	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	94	<100	<500	0.018	<0.010
121. Naphthalene	360	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	64	<100	1,000	0.020	<0.010
141. Phenanthrene	19	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	82	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	74	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #4 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.4
155. Arsenic	<0.2	94	7.4	<0.020	0.029
156. Barium	<0.9	1.3	<19	1.670	0.55
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	<0.3	<0.3	<33	<0.003	0.13
159. Chromium	1.8	40	23.7	<0.009	0.14
160. Copper	<1.0	165	107	0.027	1.13
161. Lead	2.4	27	<7.3	0.0064	0.600
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0004
163. Nickel	2.2	8.8	6.2	0.037	0.065
165. Silver	<0.9	<0.9	<18	0.018	0.092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.150
168. Zinc	9.4	4,170	6810	0.071	9.98
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	5.0	31	15	0.950	13.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5. (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019 PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (°F)	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		6.4
Carbon Monoxide Concentration (ppm volume)		0

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*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5

	Untreated Waste Concentration				Treated Waste
Detected BDAT List Organic Constituents	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	6,000	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	130,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,800	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	45,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,500	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	340	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	90	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0027
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	19	53	340	<0.002	<0.002
110. Hexachlorobenzene	87	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	113	<100	<500	0.018	<0.01
121. Naphthalene	371	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	63	<100	1,000	0.020	<0.01
141. Phenanthrene	19	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	73	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	72	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.35
155. Arsenic	<0.2	94	7.4	<0.020	0.027
156. Barium	<0.9	1.3	<19	1.670	0.600
157. Beryllium	<0.1	<0.1	NA	<0.001	0.002
158. Cadmium	0.36	<0.3	<33	<0.003	0.12
159. Chromium	3.2	40	23.7	<0.009	0.14
160. Copper	2.1	165	107	0.027	1.03
161. Lead	2.5	27	<7.3	0.0064	0.48
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001
163. Nickel	4.8	8.8	6.2	0.037	0.067
165. Silver	<0.9	<0.9	<18	0.018	0.090
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.160
168. Zinc	4.7	4,170	6810	0.071	11.1
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	12.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (°F)	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		6.8
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,100	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,600	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	98,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	6,900	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	44,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,500	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	330	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	90	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0025
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	22	53	340	<0.002	<0.002
110. Hexachlorobenzene	66	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	88	<100	<500	0.018	<0.01
121. Naphthalene	390	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	65	<100	1,000	0.020	<0.01
141. Phenanthrene	17	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	86	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	79	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.01

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6 (Continued)

	Untreated Waste Concentration				Treated Waste
Detected BDAT List Metal, Inorganic and PCB Constituents	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.32
155. Arsenic	<0.2	94	7.4	<0.020	0.033
156. Barium	<0.9	1.3	<19	1.670	0.57
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.62	<0.3	<33	<0.003	0.11
159. Chromium	5.3	40	23.7	<0.009	0.13
160. Copper	3.6	165	107	0.027	0.87
161. Lead	3.5	27	<7.3	0.0064	0.4
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001
163. Nickel	6.0	8.8	6.2	0.037	0.061
165. Silver	<0.9	<0.9	<18	0.018	0.092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16
168. Zinc	8.4	4,170	6810	0.071	10.4
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	12.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE
Afterburner Temperature (°F)	*	2350
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

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*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-6 Total Concentration Data Collected by EPA for Untreated K024: Rotary Kiln Incineration

Constituent	Untreated waste concentration							
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5[a]	Sample 6[a]	Sample 7[a]	Sample 8[a]
Volatile organics (ppm)								
Chloromethane	<10	32	<10	40	<10	10	<10	<10
Methyl ethyl ketone	240	200	210	210	680	600	690	700
Semivolatile organics (ppm)								
Phthalic acid[b,c]	220,000[d]	83,000[d]	110,000[d]	13,000[d]	NA	NA	NA	NA
Anthracene dione[b]	6,700	5,600	6,300	5,900	NA	NA	NA	NA
Metals								
(Not analyzed)								

NA = Not analyzed.

[a] Using methanol extract, a methanol blank for methyl ethyl ketone was reported as 770 ppm.

[b] Non-BDAT parameter.

[c] Phthalic acid is used as a surrogate constituent for phthalic anhydride since phthalic anhydride is converted to phthalic acid during the chemical analysis.

[d] Memo to Fred Hall, PEI Associated, Cincinnati, Ohio, from Patrick Meehan, Radian Corp., Austin, Texas, dated December 15, 1987.

Source: EPA 1987a.

Table 4-7 Total Concentration Data Collected by EPA for K024: Scrubber Water

Constituent	Scrubber water concentration									
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
Volatile organics (μg/l)										
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	12	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichlorodifluoromethane	<10	<10	<10	<10	23	<10	<10	<10	<10	<10
Methy ethyl ketone	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Semivolatile organics (μg/l)										
Phthalic acid (surrogate for phthalic anhydride)	<160[a]	<160	<160	<160	<160	<160	<160	<160	<160	<160
Anthracene dione	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Metals (mg/l)										
Arsenic	0.22	0.063	0.047	0.041	0.066	0.059	<0.02	0.022	0.024	0.035
Barium	0.10	0.077	0.11	0.16	0.41	0.039	0.35	0.037	0.097	<0.01
Cadmium	0.082	0.072	0.038	0.025	<0.02	<0.02	<0.02	<0.02	<0.02	<0.025
Chromium	0.036	0.096	<0.035	<0.035	<0.035	<0.53	<0.53	<0.035	0.65	<0.035
Copper	0.81	0.118	0.32	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Nickel	0.11	0.12	0.13	0.13	0.10	0.10	<0.075	<0.075	<0.075	<0.075
Lead	2.0	5.2	10.0	9.2	16	1.7	2.7	1.5	1.4	1.7
Zinc	1.5	1.9	1.7	1.4	1.3	2.0	0.33	0.70	0.79	1.1

[a] Memo to Fred Hall, PEI Associated, Cincinnati, Ohio, from Patrick Meehan, Radian Corp., Austin, Texas, dated December 15, 1987.

Source: EPA 1987a.

Table 4-8 Total Concentration Data Collected by EPA for K024: Ash

Constituent	Ash concentration Sample 1	 Sample 2	 Sample 3	 Sample 4[a]	 Sample 5[a]	 Sample 6[a]
Volatile organics (µg/g)						
Chloromethane	<10	<10	<10	<10	<10	<10
Methyl ethyl ketone	<50	<50	<50	1100	780	440
Semivolatile organics (µg/g)						
Phthalic acid (surrogate for phthalic anhydride)	<8.2	<8.2	<8.2	NA	NA	NA
Anthracene dione	<2.5	<2.5	<2.5	NA	NA	NA
Metals (µg/g)						
Arsenic	12	2.5	2.1	Not analyzed		
Barium	3900	85	35			
Cadmium	2.2	<1.5	<1.5			
Chromium	20	45	52			
Copper	46	25	21			
Nickel	11	44	55			
Lead	1100	110	20			
Vanadium	64	10	<10			
Zinc	170	110	29			

NA = Not analyzed.

[a] Use of methanol extract; a methanol blank for methyl ethyl ketone was reported as 770 µg/g.

Source: EPA 1987a.

Table 4-9 Total and TCLP Metals Analyses Data for Ash (K024)

Constituent	Ash concentration							
	Sample 1		Sample 2		Sample 3		Blank	
	Total (µg/g)	TCLP (ppm)	Total (µg/g)	TCLP (ppm)	Total (µg/g)	TCLP (ppm)	Total	TCLP (ppm)
Arsenic	12	<1.5	2.5	<1.5	2.1	<1.5	NA	<1.5
Barium	3900	0.38	85	0.18	35	0.084	NA	0.34
Cadmium	2.2	<0.015	<1.5	0.004	<1.5	<0.015	NA	<0.015
Chromium	20	<0.045	45	0.37	52	0.051	NA	<0.045
Copper	46	0.14	25	<0.05	21	<0.05	NA	0.37
Nickel	11	<0.10	44	1.5	55	0.11	NA	<0.10
Lead	1100	2.3	110	<0.25	20	<0.25	NA	<0.25
Thallium	1.0	<0.45	1.0	<0.45	1.0	0.17	NA	<0.45
Zinc	170	0.30	110	1.6	29	<0.10	NA	0.26

NA = Not available.

Source: EPA 1987a.

Table 4-10 Design Characteristics of the CRF Rotary Kiln System (K024)

Characteristics of the kiln main chamber		
Length	2.44 m (8 ft)	
Diameter	1.22 m (4 ft)	
Chamber volume	2.88 m^3 (100 ft^3)	
Rotation	Clockwise or counterclockwise 0.1 to 1.5 rpm	
Construction	0.63 cm (0.25 in.) thick cold rolled steel	
Refractory	12.7 cm (5 in.) thick high-alumina castable refractory, variable depth to produce a frustroconical effect for moving inerts	
Solids retention time	1 h (at 0.5 rpm)	
Burner	John Zink Model RW3I-FL	
Primary fuel	Propane	
Feed system	Liquids:	Front face, water-cooled lance with positive-displacement pump
	Semiliquids:	Front face, water-cooled lance with double-diaphragm pump
	Solids:	Ram feeder or metered twin-auger screw feeder
Temperature[a]	1000°C (1832°F)	
Characteristics of the afterburner chamber		
Length	3.05 m (10 ft)	
Diameter	0.91 m (3 ft)	
Chamber volume	2.096 m^3 (74 ft^3)	

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[a] Operating temperatures in excess of 1837°F have been generated. Waste treatment effectiveness should not be affected under these conditions.

[b] Operating pressure drops of 30 to 35 in. H_2O across the scrubber and up to 8.2 in. H_2O across the packed tower have been used.

Source: EPA 1987a.

Table 4-10 (continued) (K024)

Construction	0.63-cm (0.25-in.) thick cold rolled steel
Refractory	15.24-cm (6-in.) thick high-alumina castable refractory
Retention time	Depends on temperature and excess air (1.2 to 2.5 sec)
Burner	Iron Fireman, Model C-120-6-SMG, rated at 530 kW (1.8×10^6 Btu/h or 31.6 MJ/s)
Primary fuel	Propane
Temperature	1200°C (2200°F) maximum operating

Characteristics of the air pollution control system

System capacity	Inlet gas flow of 106.8 m^3/min (3773 acfm) at 1200°C (2200°F) and 101 kPa (14.7 psia)
Pressure drop	Venturi 7.5 kPa (30 in. WC)[b] Packed tower 1.0 kPa (4 in. WC)
Liquid flow (nominal)	Venturi 77.2 l/min (20.4 gal/min) at 69 kPA (10 psig) Tower 115 l/min (30 gal/min) at 69 kPa (10 psig) Blowdown 7.6 to 9.5 l/min (2 to 2.5 gpm)
pH control	Feedback control by NaOH solution addition
Packing	Saddles

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[a] Operating temperatures in excess of 1837°F have been generated. Waste treatment effectiveness should not be affected under these conditions.

[b] Operating pressure drops of 30 to 35 in. H_2O across the scrubber and up to 8.2 in. H_2O across the packed tower have been used.

Source: EPA 1987a.

Table 4-11 Operating Parameters of the Rotary Kiln Incinerator (K024)

Test date	Propane range (average) Feed rate (scfh)	 Heat input (10^6 Btu/h)	Waste feed rate (lb/h)	Combustion air feed rate (scfm)	Exit temperature range (average) (°F)	Rotation speed (rpm)	Pressure (draft) (in. H_2O)
3/17/87	336-424 (366)	0.822-1.040 (0.935)	53[a]	124	1573° - 1754° (1707°)	0.2	-0.12
3/18/87	282-478 (320)	0.690-1.170 (0.784)	107[b]	124	1713° - 2026° (1898°)	0.2	-0.12
3/19/87	202-342 (311)	0.496-0.839 (0.763)	104[c]	124	1510° - 1953° (1786°)	0.2	-0.12

[a] One fiber pack containing about 4.5 lb waste fed every 5 minutes.

[b] One fiber pack containing about 4.5 lb waste fed every 2.5 minutes.

[c] Two fiber packs containing about 4.5 lb waste fed every 5 minutes.

Source: EPA 1987a.

Table 4-12 Operating Parameters of the Incinerator Afterburner (K024)

Test date	Afterburner parameter range (average)							
	Propane range					Exit gas		
	Feed rate (scfh)	Heat input (10^6 Btu/h)	Combustion air feed rate (scfm)	Exit temperature (°F)	Pressure (draft) (in. H_2O)	O_2(%)	CO_2(%)[b]	CO(ppm)[a]
3/17/87	367-561 (488)	0.901-1.377 (1.196)	111-118 (113)	1963° - 2078° (2055°)	(-0.12)	5	9	<10-100[b] <10
3/18/87	378-564 (440)	0.925-1.381 (1.078)	118-124 (120)	1894° - 2155° (2025°)	-0.2 to -0.1 (-0.15)	4	10	<10-100[b] <10
3/19/87	367-636 (311)	0.897-1.599 (1.172)	(111)	1921° - 2091° (2014°)	-0.2 to -0.1 (-0.15)	5	10	<10-100[b] <10

[a] Instrument limit on CO_2 is 10 percent; on CO, 100 ppm. Actual values therefore could be higher than the peak values shown.

[b] One or more CO spikes from 40 to 100 ppm during test period.

Source: EPA 1987a.

Table 4-13 Operating Parameters of the Incinerator Scrubber System (Acurex) (K024)

	Scrubber system parameter range (average)								
	Venturi		Packed tower		Scrubber liquid		Blowdown		
Test date	Liquid flow rate (gal/min)	Delta P (in. H_2O)	Liquid flow rate (gal/min)	Delta P (in. H_2O)	pH	Temperature (°F)	Flow rate (gal/min)	Temperature (°F)	Makeup water feed rate (gal/min)
3/17/87	19	25-42 (35)	(31)	5.0-10 (6.9)	(6.2)	147° - 165° (160°)	2.1	71-102 (681)	5.0-10 (6.9)
3/18/87	19	20-43 (34)	28-29 (29)	5.0-10 (7.6)	6.0-6.2 6.1	148° - 166° (158°)	1.8-2.4 (2.3)	84-112 (94)	5.0-10 (7.6)
3/19/87	19	20-38 (34)	29-30 (29)	6.1-10 (8.2)	5.0-5.1 5.1	153° - 165° (161°)	2.2	86-119 (102)	6.1-10 (8.2)

Source: EPA 1987a.

Table 4-14 Operating Parameters of the Incinerator Scubber Exit and Stack (K024)

Test date	Operating conditions range (average)									
	Scrubber exit (prior to charcoal bed)					Stack (to atmosphere)				
	Temperature (°F)	Flow rate (dscfm)	O_2(%)	CO_2(%)	CO (ppm)	Temperature (°F)	Flow rate[a] (dscfm)	O_2 (%)	CO_2 (%)	CO (ppm)
3/17/87	164° - 173° (170°)	708	10.5	6.0	<10	163° - 170° (167°)	933	10.5	6.0	<10
3/18/87	164° - 173° (169°)	735	10.0	8.1	<10	163° - 170° (168°)	679	10.0	8.1	<10
3/19/87	160° - 174° (170°)	670	10.5	6.2	<10	161° - 172° (168°)	734	10.5	6.2	<10

[a] As measured by the stack MM5 train.

Source: EPA 1987a.

Table 4-15 Analytical Results for K087 Untreated Waste Collected Prior to Treatment by Rotary Kiln Incineration

Constituent/parameter (units)	Concentration				
	Sample Set #				
	1	2	3	4	5
BDAT Volatile Organics (mg/kg)					
Benzene	17	19	5.6	212	170
Methyl ethyl ketone	<2.0	<2.1	<2.0	<10	<10
Toluene	17	17	5.0	152	130
Xylenes	21	23	3.0	123	121
BDAT Semivolatile Organics (mg/kg)					
Acenaphthalene	11,000	12,000	10,000	13,000	10,000
Anthracene	7,500	8,100	7,100	8,100	6,700
Benz(a)anthracene	5,700	5,900	5,600	7,500	5,400
Benzo(b)fluoranthene	3,200	<1,010	3,100	<982	5,300
Benzo(k)fluoranthene	3,100	7,500	3,100	9,300	<1,026
Benzo(a)pyrene	4,100	4,300	4,100	5,400	3,800
Chrysene	5,100	5,300	5,100	6,500	4,700
para-Cresol	1,600	1,600	1,300	1,900	1,200
Fluoranthene	11,000	12,000	11,000	<982	11,000
Fluorene	7,600	7,900	7,000	9,300	7,000
Indeno(1,2,3-c,d)pyrene	2,100	2,500	2,300	3,100	2,100
Naphthalene	64,000	66,000	64,000	81,000	63,000
Phenanthrene	34,000	34,000	15,000	41,000	15,000
Phenol	1,600	1,500	1,200	1,800	1,200
Pyrene	9,100	5,900	8,000	9,700	8,100
BDAT Metals (mg/kg)[a]					
Antimony	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	6.1	6.1	5.5	1.9	5.2
Barium	<20	<20	<20	<20	<20
Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	1.7	2.1	2.1	1.7	1.9
Chromium	<2.0	<2.0	<2.0	<2.0	<2.0
Copper	3.2	4.5	3.2	<2.5	2.6
Lead	85	80	72	64	69
Mercury	2.9	3.6	3.8	4.2	3.3
Nickel	<4.0	4.6	<4.0	<4.0	<4.0
Selenium	1.2	1.6	1.3	1.4	1.2
Silver	<5.0	<5.0	<5.0	<5.0	<5.0
Thallium	2.7	2.3	2.2	2.1	2.2
Vanadium	<5.0	<5.0	<5.0	<5.0	<5.0
Zinc	63	63	58	50	66

- = Not analyzed.

Note: This table shows the concentrations or maximum potential concentrations in the kiln ash for all constituents that were detected in the untreated waste or detected in residuals generated from treatment of the waste.

Source: USEPA 1986b.

Table 4-15 (continued)

Constituent/parameter (units)	Concentration				
	Sample Set #				
	1	2	3	4	5
BDAT Inorganics Other Than Metals (mg/kg)					
Cyanide	22.8	18.2	21.1	22.0	17.9
Fluoride	0.38	-	-	-	0.18
Sulfide	323	320	275	293	302
Non-BDAT Volatile Organics (mg/kg)					
Styrene	12	12	3.4	26	71
Non-BDAT Semivolatile Organics (mg/kg)					
Dibenzofuran	5,300	5,600	5,200	6,800	5,000
2-Methylnaphthalene	7,000	6,900	6,300	9,400	6,200
Other Parameters					
Ash content (%)	2.9	3.4	9.7	3.7	2.7
Heating value (Btu/lb)	15,095	14,898	14,823	15,336	14,959
Percent water (%)	5.70	10.31	11.26	7.72	6.60
Total halogens as chlorine (%)	0.033	0.023	0.026	0.045	0.057
Total organic carbon (%)	83.67	76.38	84.27	79.10	85.57
Total organic halides (mg/kg)	27.0	28.0	29.3	87.7	25.8
Total solids (%)[b]	87.7	90.5	91.1	89.7	86.5
Viscosity[c]	-	-	-	-	-
Elemental constituents (%)					
Carbon	83.80	81.90	84.01	66.36	77.54
Hydrogen	5.62	5.14	5.27	6.46	5.97
Nitrogen	1.13	1.06	1.03	0.82	0.96
Oxygen	9.13	11.94	10.25	26.59	15.71

- = Not analyzed.
ND = Not detected; estimated detection limit has not been determined.

[a] Results have been reported on a wet weight basis.
[b] Total solids results are biased low because of test complications arising from waste matrix.
[c] Because of the high concentration of solids in the waste, viscosity values could not be determined.

Note: This table shows concentrations or maximum potential concentrations in the untreated waste for all constituents detected in the untreated waste or detected in the residuals generated by treatment of the waste.

Reference: USEPA 1988a.

Table 4-16 Analytical Results for Kiln Ash Generated by Rotary Kiln Incineration of K087 Waste

Constituent/parameter (units)	Concentration				
	Sample Set #				
	1	2	3	4	5
BDAT Volatile Organics (μg/kg)					
Benzene	<25	<25	<25	<25	<25
Methyl ethyl ketone	<25	<25	<25	<25	<25
Toluene	150	85	<25	<25	190
Xylenes	<25	<25	<25	<25	<25
BDAT Semivolatile Organics (μg/kg)					
Acenaphthalene	<1000	<1000	<1000	<1000	<1000
Anthracene	<1000	<1000	<1000	<1000	<1000
Benz(a)anthracene	<1000	<1000	<1000	<1000	<1000
Benzo(b)fluoranthene	<1000	<1000	<1000	<1000	<1000
Benzo(k)fluoranthene	<1000	<1000	<1000	<1000	<1000
Benzo(a)pyrene	<1000	<1000	<1000	<1000	<1000
Chrysene	<1000	<1000	<1000	<1000	<1000
para-Cresol	<1000	<1000	<1000	<1000	<1000
Fluoranthene	<1000	<1000	<1000	<1000	<1000
Fluorene	<1000	<1000	<1000	<1000	<1000
Indeno(1,2,3-c,d)pyrene	<1000	<1000	<1000	<1000	<1000
Naphthalene	<1000	<1000	<1000	<1000	<1000
Phenanthrene	<1000	<1000	<1000	<1000	<1000
Phenol	<1000	<1000	<1000	<1000	<1000
Pyrene	<1000	<1000	<1000	<1000	<1000
BDAT Metals (mg/kg)					
Antimony	<3.2	<2.0	<2.0	<2.0	<3.2
Arsenic	9.9	11	6.7	12	5.3
Barium	317	56	53	41	63
Beryllium	0.60	<0.5	<0.5	<0.5	0.36
Cadmium	<0.40	<1.0	<1.0	<1.0	<0.40
Chromium	34	5.2	2.2	2.1	7.6
Copper	746	44	43	50	94
Lead	44	8.2	8.3	5.9	7.2
Mercury	<0.10	2.8	2.9	3.3	<0.1
Nickel	10	<4.0	<4.0	<4.0	4.5
Selenium	1.4	1.6	<0.50	5.9	<0.5
Silver	<0.60	<5.0	<5.0	<5.0	<6.0
Thallium	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	17	9.7	6.6	8.1	10
Zinc	50	13	13	12	21

- = Not analyzed.

Note: This table shows the concentrations or maximum potential concentrations in the kiln ash for all constituents that were detected in the untreated waste or detected in residuals generated from treatment of the waste.

Table 4-16 (continued) K087

Constituent/parameter (units)	Concentration Sample Set # 1	 2	 3	 4	 5
BDAT TCLP: Metals (µg/l)					
Antimony	425	<20	<20	<20	<32
Arsenic	96	33	25	19	43
Barium	609	344	547	641	546
Beryllium	3.3	<5.0	<5.0	<5.0	2.5
Cadmium	<4.0	<10	<10	<10	<4.0
Chromium	62	<20	<20	<20	8.7
Copper	<6.0	52	1110	346	497
Lead	29	40	53	20	106
Mercury	<0.2	<0.30	<0.30	<0.30	<0.2
Nickel	93	<40	<40	<40	16
Selenium	<50	7.3	<5.0	<5.0	<5.0
Silver	<6.0	<50	<50	<50	<6.0
Thallium	<10	<10	<10	<10	<500
Vanadium	<30	<50	<50	<50	8.3
Zinc	169	202	218	288	256
BDAT Inorganics Other Than Metals (mg/kg)					
Cyanide	0.74	<0.50	<0.50	<0.50	<0.50
Fluoride	<1.0	-	-	-	<0.25
Sulfide	35.5	36.3	144	116	11.0
Non-BDAT Volatile Organics (µg/kg)					
Styrene	<25	<25	<25	<25	<25
Non-BDAT Semivolatile Organics (µg/kg)					
Dibenzofuran	<1000	<1000	<1000	<1000	<1000
2-Methylnaphthalene	<1000	<1000	<1000	<1000	<1000
Other Parameters (mg/kg)					
Total organic carbon	350000	553000	402000	316000	244000
Total chlorides	9.7	6.8	14.1	14.6	16.0
Total organic halides	375	18.3	32.1	19.8	133

- = Not analyzed.

Note: This table shows the concentrations or maximum potential concentrations in the kiln ash for all constituents that were detected in the untreated waste or detected in residuals generated from treatment of the waste.

Source: USEPA 1986b.

Table 4-17 Analytical Results for Scrubber Water Generated by Rotary Kiln Incineration of K087 Waste

Constituent/parameter (units)	Concentration					
	Sample[a]					
	1	2	3	4	5	6
BDAT Volatile Organics (µg/l)						
Benzene	<5	<5	<5	<5	<5	<5
Methyl ethyl ketone	14	<10	<10	<10	<10	<10
Toluene	<5	8	<5	<5	<5	<5
Xylenes	<5	<5	<5	<5	<5	<5
BDAT Semivolatile Organics (µg/l)						
Acenaphthalene	<10	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<10
Benz(a)anthracene	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<10
para-Cresol	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-c,d)pyrene	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10	<10
Phenol	<10	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10	<10
BDAT Metals (µg/l)						
Antimony	<32	<33	<20	39	<20	<32
Arsenic	211	191	148	257	300	342
Barium	65	350	302	340	290	102
Beryllium	<1.0	1.3	<5.0	<5.0	<5.0	<1.0
Cadmium	26	15	21	41	42	51
Chromium	306	304	155	236	255	259
Copper	1050	1100	948	1240	1160	1240
Lead	5610	7000	3240	4780	5610	4840
Mercury	0.23	<0.20	0.48	0.33	0.30	0.40
Nickel	<11	<11	<40	<40	<40	<11
Selenium	81	61	5.7	83	87	87
Silver	<6.0	<7.0	<50	<50	<50	<6.0
Thallium	126	109	77	108	96	136
Vanadium	15	12	<50	<50	<50	18
Zinc	2250	2040	1740	2910	2670	2960

Table 4-17 (continued)

Constituent/parameter (units)	Concentration					
	Sample[a]					
	1	2	3	4	4	6
BDAT Inorganics Other Than Metals (mg/l)						
Cyanide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	3.38	2.99	2.38	-	-	3.54
Sulfide	<1.0	<1.0	11.9	<1.0	<1.0	<1.0
Non-BDAT Volatile Organics (μg/l)						
Styrene	<5	<5	<5	<5	<5	<5
Non-BDAT Semivolatile Organics (μg/l)						
Dibenzofuran	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10	<10
Other Parameters						
Total organic carbon (mg/l)	37.9	26.1	88.9	148	111	94.1
Total solids (mg/l)	2240	2080	1910	2350	2480	2720
Total chlorides (mg/l)	51.3	57.9	48.5	51.0	58.3	56.0
Total organic halides (μg/l)	33.7	33.2	48.7	23.3	27.6	27.4

- = Not analyzed.

[a] Scrubber water samples are not assigned a sample set number. See the K087 OER (USEPA 1986b) for specific collection times.

Note: This table shows concentrations or maximum potential concentrations in the scrubber water for all constituents detected in the untreated waste or detected in residuals generated from treatment of the waste.

Source: USEPA 1986b.

Table 4-18 Performance Data for Untreated F006 Wastes and Treated F006 Wastes Treated by Stabilization

Source	Mix ratio[a]	Metal concentrations (ppm)										
		Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Unknown												
Unstabilized												
As received		-	36.4	1.3	1270	40.2	35.5	-	435	-	2.3	1560
TCLP		<0.01	0.08	0.01	0.34	0.15	0.26	<0.001	0.71	<0.01	0.01	0.16
Stabilized												
TCLP	0.2	<0.01	0.12	0.01	0.51	0.20	0.30	<0.001	0.04	0.06	0.03	0.03
Auto part manufacturing												
Unstabilized												
As received		-	21.6	31.3	755	7030	409	-	989	-	6.62	4020
TCLP		<0.01	0.32	2.21	0.76	368	10.7	<0.001	22.7	<0.01	0.14	219
Stabilized												
TCLP	0.2	<0.01	0.50	0.50	0.40	5.4	0.40	<0.001	1.5	0.06	0.03	36.9
TCLP	0.5	<0.01	0.42	0.01	0.39	0.25	0.36	<0.001	0.03	0.11	0.05	0.01
Aircraft overhauling												
Unstabilized												
As received		-	85.5	67.3	716	693	25.7	-	259	-	39	631
TCLP		0.01	1.41	1.13	0.43	1.33	0.26	<0.001	1.1	<0.01	0.02	5.41
Stabilized												
TCLP	0.2	<0.01	0.33	0.06	0.08	1.64	0.30	<0.001	0.23	0.07	0.20	0.05
TCLP	0.5	<0.01	0.31	0.02	0.20	1.84	0.41	<0.001	0.15	0.11	0.05	0.03
Aerospace manufacturing (F006 & F007 mixture)												
Unstabilized												
As received		-	0.74	1.69	12.9	18.6	11.4	-	234	-	6.26	8.86
TCLP		<0.01	0.83	0.66	7.58	4.12	6.86	0.003	158	<0.01	1.64	2.28
Stabilized												
TCLP	1.0	<0.01	0.52	<0.01	0.40	0.23	0.20	<0.001	4.35	0.17	0.09	0.05
TCLP	1.5	<0.01	1.18	0.01	0.34	0.19	0.36	<0.001	2.47	0.20	0.15	0.03

[a] Mix ratio = $\frac{\text{weight of reagent}}{\text{weight of waste}}$

Source: USEPA 1988r.

Table 4-18 (continued)

Source	Mix ratio[a]	Metal concentrations (ppm)										
		Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Zinc plating												
Unstabilized												
As received		-	17.2	1.30	110	1510	88.5		37	-	9.05	90,200
TCLP		-	0.84	0.22	0.18	4.6	0.45	<0.001	0.52	-	0.16	2030
Stabilized												
TCLP	0.2	<0.01	0.20	0.01	0.23	0.30	0.30	<0.001	0.10	0.08	0.03	32
TCLP	0.5	<0.01	0.23	0.01	0.30	0.27	0.34	<0.001	0.02	0.14	0.04	0.04
Unknown												
Unstabilized												
As received		-	14.3	720	12,200	160	52	-	701	-	5.28	35,900
TCLP		<0.01	0.38	23.6	25.3	1.14	0.45	<0.001	9.78	<0.01	0.08	867
Stabilized												
TCLP	0.2	<0.01	0.31	3.23	0.25	0.20	0.24	<0.001	0.53	0.04	0.04	3.4
TCLP	0.5	<0.01	0.19	0.01	0.38	0.29	0.36	<0.001	0.04	0.09	0.06	0.03
Small engine manufacturing												
Unstabilized												
As received		-	24.5	7.28	3100	1220	113	-	19,400	-	4.08	27,800
TCLP		<0.01	0.07	0.3	38.7	31.7	3.37	0.003	730	<0.01	0.12	1200
Stabilized												
TCLP	0.2	<0.01	0.30	0.02	0.21	0.21	0.30	<0.001	16.5	0.05	0.03	36.3
TCLP	0.5	<0.01	0.33	0.01	0.76	0.20	0.36	<0.001	0.05	0.11	0.05	0.04
Circuit board manufacturing												
Unstabilized												
As received		-	12.6	5.39	42,900	10,600	156	-	13,000	-	12.5	120
TCLP		<0.01	0.04	0.06	360	8.69	1.0	<0.001	152	<0.01	0.05	0.62
Stabilized												
TCLP	0.2	<0.01	0.04	0.01	3.0	0.40	0.30	<0.001	0.40	0.04	0.03	0.02
TCLP	0.5	<0.01	0.14	0.01	1.21	0.42	0.38	<0.001	0.10	0.07	0.05	0.02

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[a] Mix ratio = $\frac{\text{weight of reagent}}{\text{weight of waste}}$

Source: USEPA 1988r.

Table 4-18 (continued)

Source	Mix ratio[a]	Metal concentrations (ppm)										
		Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Unknown												
Unstabilized												
As received		-	15.3	5.81	47.9	17,600	169	-	23,700	-	8.11	15,700
TCLP		<0.01	0.53	0.18	0.04	483	4.22	<0.001	644	<0.01	0.31	650
Stabilized												
TCLP	0.2	<0.01	0.32	0.01	0.10	0.50	0.31	<0.001	15.7	0.07	0.03	4.54
TCLP	0.5	<0.01	0.27	0.01	0.2	0.32	0.37	<0.001	0.04	0.07	0.05	0.02
Unknown												
Unstabilized												
As received		-	19.2	5.04	644	27,400	24,500	-	5,730	-	19.1	322
TCLP		0.88	0.28	0.01	0.01	16.9	50.2	<0.001	15.1	<0.45	<0.01	1.29
Stabilized												
TCLP	0.2	<0.02	0.19	<0.01	0.03	3.18	2.39	<0.001	1.09	<0.01	<0.01	0.07
TCLP	0.5	<0.02	0.08	<0.01	0.21	0.46	0.27	<0.001	0.02	<0.01	<0.01	<0.01

[a] Mix ratio = $\frac{\text{weight of reagent}}{\text{weight of waste}}$

Source: USEPA 1988r.

Table 4-19 Performance Data for Chemical Precipitation and Filtration of Mixed Waste Sampled by EPA at Envirite Co.

Constituent/parameter	Concentration (ppm)							
	Sample Set #1		Sample Set #2		Sample Set #3		Sample Set #4	
	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate
BDAT Metals								
Antimony	<10	<1	<10	<1	<10	<1	<10	-
Arsenic	<1	<0.1	<1	<0.1	<1	<0.1	<1	<1
Barium	<10	<1	<10	<1	<10	3.5	<10	<10
Beryllium	<2	<0.2	<2	<0.2	<2	<0.2	<2	<2
Cadmium	13	<0.5	10	<0.5	<5	<0.5	<5	<5
Chromium (hexavalent)	893	0.011	807	0.190	775	-[a]	0.6	0.042
Chromium (total)	2,581	0.12	2,279	0.12	1,990	0.20	556	0.10
Copper	138	0.21	133	0.15	133	0.21	88	0.07
Lead	64	<0.01	54	<0.01	<10	<0.01	<10	<0.01
Mercury	<1	<0.1	<1	<0.1	<1	<0.1	<1	<1
Nickel	471	0.33	470	0.33	16,330	0.33	6,610	0.33
Selenium	<10	<1	<10	<1	<10	<1	<10	<10
Silver	<2	<0.2	2	<0.2	<2	<0.3	<2	<2
Thallium	<10	<1	<10	<1	<10	<1	<10	<10
Zinc	116	0.125	4	0.115	3.9	0.140	84	1.62
Other Parameters								
Total organic carbon	2700		2800		500		2900	
Total solids	-		-		-		-	
Total chlorides	-		-		-		-	
Total organic halides	2500		3600		0		900	

- = Not analyzed.

[a] Hexavalent chromium was actually treated by chromium reduction prior to chemical precipitation and sludge filtration.

Note: Design and Operating Parameters are as follows:

pH during chromium reduction - 8.5 to 9.0.
Reducing agent - ferrous iron.
Ratio of reducing agent to hexavalent chromium - 3.2 to 10.
pH during chemical precipitation - 8 to 10.
Precipitation agents - lime and sulfide.
Filter type - vacuum filter.

Source: USEPA 1988s.

Table 4-19 (continued)

Constituent/parameter	Concentration (ppm)							
	Sample Set #5		Sample Set #6		Sample Set #7		Sample Set #8	
	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate	Treatment tank composite	Filtrate
BDAT Metals								
Antimony	<10	<1	<10	<1	<10	<1	<10	<1
Arsenic	<1	<0.1	<1	<0.1	<1	<0.1	<1	<0.1
Barium	<10	<1	<10	<2	<10	<1	<10	<1
Beryllium	<2	<0.2	<2	<0.2	<2	<0.2	<2	<0.2
Cadmium	<5	<0.5	<5	<0.5	10	<0.5	<5	<0.5
Chromium (hexavalent)	917	0.058	734	-^{a}	769	0.121	0.13	<0.01
Chromium (total)	2,236	0.11	2,548	0.10	2,314	0.12	831	0.15
Copper	91	0.14	149	0.12	72	0.16	217	0.16
Lead	18	<0.01	<10	<0.01	108	<0.01	212	<0.01
Mercury	1	<0.1	<1	<0.1	<1	<0.01	<1	<0.1
Nickel	1,414	0.310	588	0.33	426	0.40	669	0.36
Selenium	<10	<1	<10	<1	<10	<1	<10	<1
Silver	<2	<0.2	<2	<0.2	<2	<0.2	<2	<0.2
Thallium	<10	<1	<10	<1	<10	<1	<10	<1
Zinc	71	0.125	4	0.095	171	0.115	151	0.130
Other Parameters								
Total organic carbon	200		700		3400		5900	
Total solids	-		-		-		-	
Total chlorides	-		-		-		-	
Total organic halides	0		700		1900		800	

- = Not analyzed.

[a] Hexavalent chromium was actually treated by chromium reduction prior to chemical precipitation and sludge filtration.

Note: Design and Operating Parameters are as follows:

pH during chromium reduction - 8.5 to 9.0.

Reducing agent - ferrous iron.

Ratio of reducing agent to hexavalent chromium - 3.2 to 10.

pH during chemical precipitation - 8 to 10.

Precipitation agents - lime and sulfide.

Filter type - vacuum filter.

Source: USEPA 1988s.

Table 4-19 (continued)

Constituent/parameter	Concentration (ppm) Sample Set #9 Treatment tank composite	 Filtrate	 Sample Set #10 Treatment tank composite	 Filtrate	 Sample Set #11 Treatment tank composite	 Filtrate
BDAT Metals						
Antimony	<10	<1	<10	<1	<10	<1.00
Arsenic	<1	<0.1	<1	<0.1	<1	<0.10
Barium	<10	<1	<10	<1	<12	<1.00
Beryllium	<2	<0.2	<2	<0.2	<2	<0.20
Cadmium	<5	<0.5	<5	<0.5	23	<5
Chromium (hexavalent)	0.07	0.041	0.08	0.106	0.30	<0.01
Chromium (total)	939	0.10	395	0.12	617	0.18
Copper	225	0.08	191	0.14	137	0.24
Lead	<10	<0.01	<10	<0.01	136	<0.01
Mercury	<1	<0.1	<1	<0.1	<1	<0.10
Nickel	940	0.33	712	0.33	382	0.39
Selenium	<10	<1.0	<10	<1	<10	<1.00
Silver	<2	<0.2	<2	<0.2	<2	<0.2
Thallium	<10	<1.0	<10	<1	<10	<1.00
Zinc	5	0.06	5	0.070	135	0.100
Other Parameters						
Total organic carbon	2100		0		52	
Total solids	-		-		-	
Total chlorides	-		-		-	
Total organic halides	0		<300		300	

- = Not analyzed.

[a] Hexavalent chromium was actually treated by chromium reduction prior to chemical precipitation and sludge filtration.

Note: Design and Operating Parameters are as follows:

pH during chromium reduction - 8.5 to 9.0.

Reducing agent - ferrous iron.

Ratio of reducing agent to hexavalent chromium - 3.2 to 10.

pH during chemical precipitation - 8 to 10.

Precipitation agents - lime and sulfide.

Filter type - vacuum filter.

Source: USEPA 1988s.

6. CALCULATION OF PROPOSED BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards account for analytical limitations in available treatment performance data and for variabilities related to treatment, sampling, and analytical techniques and procedures. The purpose of this section is to calculate proposed treatment standards for the polynuclear aromatic U-wastes using the available treatment performance data from the BDAT treatment technologies. A discussion of how the treatment standards for these wastes were calculated is included in this section. For further information on calculation of BDAT treatment standards, refer to the Methodology for Developing Best Demonstrated Available Technology (BDAT) Treatment Standards.

Tables 6-1 and 6-2 at the end of this section present the calculation of the proposed treatment standards for polynuclear aromatic wastes. These proposed treatment standards were calculated as follows. The Agency reviewed its BDAT incineration data base to compile data for incinerator ash and scrubber water residuals. The Agency chose to use the concentration treatment performance data (detection limits) from K001, K019, K024, and K087 to develop the proposed treatment standards for the polynuclear aromatic U-wastes. (K001, K019, K024, and K087 incinerator ash and scrubber water detection limits data are included in Tables 6-3 through 6-11.) Proposed treatment standards for nonwastewaters and wastewaters were calculated by multiplying the highest detection limit for each waste constituent by the highest recovery factor (lowest percent recovery) for that constituent or a similar constituent and then multiplying by a variability factor of 2.8 (used when the treated residuals are below the detection limit). Appendix A presents the treated waste detection limits for all of the incineration performance data considered by the Agency for this Third Third rulemaking.

If the constituent to be regulated was not present in any of the untreated F and K waste, then the Agency selected the highest detection limit from all the incinerator ash and scrubber water detection limits considered for this rulemaking.* All incinerator ash and scrubber water detection limits considered for this rulemaking are included in Appendix A of this document. Included in Appendix B are the matrix spike recoveries for F006, K001, K019, K061, K087, and K101, which were used to correct the treatment performance data used to develop the proposed treatment standards.

Before the proposed treatment standards were calculated, the treatment performance data were corrected to account for analytical interferences associated with the chemical matrices of the samples. The treatment performance data were corrected by multiplying the detection limit data by the lowest percent recovery calculated for that constituent. The correction factor was then calculated as the reciprocal of the lowest percent recovery. For constituents not present in the F and K untreated waste, EPA selected the lowest average percent recovery value from all waste codes considered for this rulemaking. All of the polynuclear aromatic constituents are base/neutral extractables, so the lowest average percent recovery was selected from among this group of compounds.

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* The Agency chose not to use the performance data/detection limit data from waste codes containing CBI performance data, i.e., K022 and K086. Detection limit data from waste codes K011, K013, and K014 were not considered because the detection limits data were clearly above the average detection limit ranges when compared to the other waste codes considered for this rulemaking. In addition, these data did not have significant concentrations of the constituents of concern in the untreated wastes. The Agency is reevaluating these data to determine whether they can be used. If they are determined to be usable, the Agency may include these data in the final rule for determining the final treatment performance standards. Further, EPA did not choose some of the higher detection limits for one constituent, 2-acetylaminofluorene (in waste codes K001, K024, and K037). The Agency did not select the high detection limits from these waste codes because EPA believes that during the analyses of the waste matrices, this constituent was not the constituent of concern, (i.e., was not expected to be present) consequently, the Agency believes that there was possibly no attempt made to refine the detection limits specific for these constituents to a lower value. (See Appendix A for a complete list of detection limits for all waste codes considered for this rulemaking.)

Since the performance data for treatment of K001, K019, K024, and K087 show that all the constituents of concern in the polynuclear aromatic U-wastes treatability group were treated below the detection limits, the Agency selected the detection limit data from these waste codes to calculate the proposed treatment standards.

In calculating treatment standards, it is necessary to determine the variability factor (VF) for each regulated constituent. The variability factor accounts for the variability inherent in treatment system performance, treatment residual collection, and analysis of the treated waste samples. Constituents of concern in waste codes K001, K019, K024, and K087 treated residuals were treated below the detection limit. Where concentrations in the treated waste were reported at less than or equal to the detection limit for all the points in the data set, variability is still expected since the actual concentration could range from 0 to the detection limit. In these cases, the Agency assumed a lognormal distribution of data points between the detection limit and a value 1/10th of the detection limit and calculated a variability of 2.8. (For more information on calculation of variability factors, see EPA's Methodology for Developing Best Demonstrated Available Technology (BDAT) Treatment Standards.)

Proposed treatment standards were calculated by multiplying the analytical accuracy-corrected treatment performance values by the variability factor of 2.8 for each constituent.

Tables 6-1 and 6-2 (following this section) summarize the calculation of proposed treatment standards for the wastes included in this document. Sections 6.1.1 and 6.1.2 describe calculation of the proposed treatment standards in greater detail. Section 6.1.3 discusses the treatment performance standards for U051 wastes. Section 6.1.4 presents the Agency's rationale for proposing a method of treatment as BDAT for U016, U064, and U094 wastes.

6.1 Nonwastewaters

6.1.1 Calculation of Proposed Treatment Standards for Nonwastewater Forms of U018, U022, U050, U120, U137, and U165

Constitutents of concern in benz(a)anthracene (U018), benzo(a)pyrene (U022), chrysene (U050), fluoranthene (U120), ideno(1,2,3-c,d) pyrene (U137), and naphthalene (U165), were present in the untreated forms of the tested wastes, i.e., K001, K019, K024, and K087. Therefore, the proposed treatment standards were calculated by multiplying the highest detection limit from these K wastes times an analytical accuracy-correction factor (lowest percent recovery) for that constituent or the lowest average percent recovery for the semivolatiles group (base/neutral extractables) times a variability factor of 2.8.

6.1.2 Calculation of Proposed Treatment Standards for Nonwastewater Forms of U005, U063, and U157

Treatment performance data were not available for treatment of 2-acetylaminofluorene (U005), dibenzo(a,h)anthracene (U063), and 3-methylcholanthrene (U157). Constituents of concern in the untreated U-wastes were not found in any of the untreated F or K wastes; however, detection limit data were available from the F and K wastes treated residuals (ash and scrubber water). (See Appendix A.) To develop the proposed treatment standard, the Agency compared all the treated residuals detection limit data (ash and scrubber water) from the F and K wastes and generally* selected the highest detection limit to calculate the proposed treatment standards. The proposed treatment standard was then calculated by multiplying this detection limit (highest detection limit found) times an analytical accuracy correction factor (lowest percent recovery) for that constituent or the lowest average percent recovery for the semivolatiles (base/neutral extractables), times a variability factor of 2.8.

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* Some unusually high detection limits were found for 2-acetylaminofluorene (U005). However, the unusally high limits were not selected because the Agency believes that during the analysis of the waste matrices this constituent 2-acetylaminofluorene was not the constituent of concern (i.e., was not expected to be present); consequently, the Agency believes that possibly there was no attempt made to refine the detection limits specific to these constituents to a lower value.

6.1.3 Proposed Treatment Performance Standards for U051 Waste

Proposed treatment standards for U051 (creosote) waste are proposed based on the transfer of performance data* from incineration of K001 waste (bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol). Treatment standards for K001 wastewaters and nonwastewaters were promulgated in the First Third final rule on August 8, 1988. The standards for organics in K001 wastes were based on the performance of rotary kiln incineration of K001 nonwastewaters.

Treatment standards for the leachable metal constituents in K001 nonwastewaters were established based on the performance of stabilization of F006 waste. Hence, treatment standards for metals (lead) in U051 nonwastewaters are also based on F006 data.

U051 wastes differ from other U wastes in the polynuclear aromatic group in that the waste is not defined by one chemical or constituent, but by a group of chemicals defined by the generic term "creosote." Creosote is a derivative of coal that contains a wide range of constituents including cresols, phenols, naphthalene, benz(a)anthracene, benzo(a)pyrene, fluoranthene, chrysene, indeno(1,2,3-c,d)pyrene and acenaphthalene. The presence of these polynuclear aromatics is the main reason that this waste code has been placed in this treatability group.

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* In the process of developing treatment standards for the Third Third rulemaking, the Agency has determined that the K001 treatment standards (nonwastewaters and wastewaters) promulgated in the First Third rulemaking are incorrect. EPA has reexamined all the K001 analytical data and is proposing standards for U051 (creosote) based on this reassessment of the K001 data. As a result, the U051 (creosote) standards differ significantly from the K001 standards. The Agency has also decided to repropose the K001 treatment standards. (Note that the lead standards will not be affected as they were not based on K001 data.)

The transfer of performance data from K001 waste treatment is particularly appropriate for U051 because K001-creosote waste obviously contains creosote. Based on the similarities in concentration of the major hazardous organic constituents anticipated in creosote (U051) to those in K001, and the primary use of creosote as a wood preservative (and hence the relationship to K001) the Agency has decided to propose to regulate the same constituents in U051 that were regulated in K001.

Incineration in a rotary kiln will achieve a level of performance that represents BDAT for the organics in U051. Thus, EPA is proposing concentration-based standards for six organic constituents in U051: naphthalene, pentachlorophenol, phenanthrene, pyrene, toluene, and xylenes. Based on the fact that the performance data for K001 indicate the presence of treatable quantities of metals in the incinerator ash and based on the anticipated similarities of U051 wastes to K001 wastes, EPA is also proposing treatment standards for metals. These standards are based on stabilization as BDAT for U051 nonwastewaters and chemical precipitation followed by sludge filtration as BDAT for U051 wastewaters.

EPA notes, however, that if U051 is simply discarded before it is used, for example because it is off specification, then it would be unlikely to have all of the same contaminants as K001 wastes. On the other hand, when U051 is spilled at a wood preserving site, then it could contain the same contaminants, in particular pentachlorophenol and lead, as K001 wastes due to the high potential for cross contamination due to prior use of pentachlorophenol at the site. Since the Agency anticipates that most of the U051 waste comes from spill residues at wood preserving sites, EPA is conservatively proposing standards that include those constituents that are likely to be present in this form of the waste. In situations where a facility never used pentachlorophenol or where the U051 is only anticipated to be generated as an off-specification product (and pentachlorophenol was never used in the production equipment), EPA anticipates that the facility's waste analysis plan could be revised so that only the constituents that are likely to be present in that form of the waste are monitored. (See also the preamble discussion in Section III.A.1.f.(3.) on waste analysis plan.

6.1.4 Wastes for Which EPA Is Proposing a Method of Treatment as BDAT

The Agency has determined that currently there are no calibration analytical reagents that are routinely available for the measurement of benz(c)acridine (U016), 1,2,7,8-dibenzopyrene (U064), and 7,12-dimethyl benz(a)anthracene (U094) in treatment residuals. As a result, concentration-based standards for these constituents are not feasible. Since Section 3004(m) of the Resource Conservation and Recovery Act (RCRA) allows the Agency to establish either levels or methods of treatment, the Agency is proposing a standard of "Incineration as a method of treatment" for U016, U064, and U094 nonwastewaters.

6.2 Wastewaters

6.2.1 Calculation of Proposed Treatment Standards for Wastewaters

The proposed BDAT treatment standards for the wastewater forms of the polynuclear aromatic U-wastes are based on the K001, K019, K024, and K087 incineration scrubber water residuals. The methodology for the transfer of performance data from K001, K019, K024, and K087 to the wastewater forms of the polynuclear aromatic U-wastes is identical to that presented in Sections 6.1.1, 6.1.2, and 6.1.3 for the nonwastewater forms; however, the standards for wastewaters are based on incinerator scrubber water residuals.

EPA is proposing to use the incineration scrubber water residuals data to develop the proposed wastewater standards. EPA believes that incineration of these wastewaters is feasible because incineration typically provides significant destruction (even for wastewaters) and that some of these wastewaters may actually contain high concentrations (near 1 percent total organic carbon (TOC) of carbon. Furthermore, commenters to the Second Third proposed rule, indicated that they indeed were incinerating many wastewaters and they did not want to be precluded from doing so where EPA had proposed only carbon adsorption as a method of treatment for wastewater forms of certain U and P organo-phosphorous pesticides. However, additional data are available for the treatment of these constituents in wastewaters and alternative standards based on these data are presented in Section III.A.7 of the preamble notice for wastewater forms of multisource leachate.

6.2.2 Wastes for Which EPA is Proposing a Method of Treatment as BDAT

The Agency has determined that currently there are no calibration analytical reagents that are routinely available for measurement of benz(c)acridine (U016), 1,2,7,8-dibenzopyrene (U064), and 7,12-dimethylbenz(a)anthracene (U094) in treatment residuals. As a result, concentration-based standards for these constituents are not feasible. See Section A.1.h.(2.)(b.) of the preamble for further discussion of the Agency's approach in such instances. Since Section 3004(m) of RCRA allows the Agency to establish either levels or methods of treatment, the Agency is proposing a standard of wet air oxidation or chemical oxidation followed by carbon adsorption, biodegradation followed by carbon adsorption, or incineration as a method of treatment for U016, U064, and U094 wastewaters.

Table 6-1 Calculation of Proposed Treatment Standards for Polynuclear Aromatic U-Wastes (Nonwastewaters)

Waste code	Constituent	Waste detection limit transferred from	Highest detection limit (DL) mg/kg	Accuracy correction factor (ACF)	Correction factor transferred from	Variability factor (VF)	Treatment standard (mg/kg) (DL x ACF x VF)
U005	2-Acetylaminofluorene	K087	2.0	2.36	K101[a]	2.8	13
U018	Benz(a)anthracene	K087	1.0	1.27	K087	2.8	3.6
U022	Benzo(a)pyrene	K087	1.0	1.27	K087	2.8	3.6
U050	Chrysene	K087	1.0	1.27	K087	2.8	3.6
U063	Dibenzo(a,h)anthracene	K019	2.0	2.36	K101[a]	2.8	13
U120	Fluoranthene	K087	1.0	1.27	K087	2.8	3.6
U137	Indeno(1,2,3-c,d)pyrene	K087	1.0	1.27	K087	2.8	3.6
U157	3-Methylcholanthrene	K024	5.0	2.36	K101[a]	2.8	33
U165	Naphthalene	K019	2.0	1.06	K019	2.8	5.9
	Naphthalene	K001 (PCP)	0.5	1.06[b]	K001 (PCP)	2.8	1.5
	Pentachlorophenol	K001 (PCP)	2.5	1.05	K001 (PCP)	2.8	7.4
	Phenanthrene	K001 (PCP)	0.5	1.06[b]	K001 (PCP)	2.8	1.5
U051	Pyrene	K001 (PCP)	0.5	1.04	K001 (PCP)	2.8	1.5
	Toluene	K001 (Creosote)	10.0	1.01	K001 (Creosote)	2.8	28
	Xylenes	K001 (Creosote)	10.0	1.16[b]	K001 (Creosote)	2.8	33

pcp - pentachlorophenol

[a] Since this constituent was not found in any of the untreated F or K wastes, the correction factor of 2.36 from waste code K101 was determined by selecting the lowest average percent recovery for base-neutral extractable semivolatiles from all the incineration performance data and corresponding recovery data considered for this Third Third rulemaking.

[b] No recovery value was available for this constituent; hence, the lowest average percent value was used. (Recovery values greater than 100 percent were considered to be just 100 percent for calculating the average and determining the accuracy-correction factors.)

Table 6-2 Calculation of Proposed Treatment Standards for Polynuclear Aromatic U-Wastes (Wastewaters)

Waste code	Constituent	Waste detection limit transferred from	Highest detection limit (DL) mg/kg	Accuracy correction factor (ACF)	Correction factor transferred from	Variability factor (VF)	Treatment standard (mg/kg) (DL x ACF x VF)
U005	2-Acetylaminofluorene	K087	0.010	2.06	K101[a]	2.8	0.058
U018	Benz(a)anthracene	K087	0.010	1.08	K087	2.8	0.030
U022	Benzo(a)pyrene	K087	0.010	1.08	K087	2.8	0.030
U050	Chrysene	K087	0.050	1.08	K087	2.8	0.15
U063	Dibenzo(a,h)anthracene	K019	0.002	2.06	K101[a]	2.8	0.012
U120	Fluoranthene	K087	0.010	1.08	K087	2.8	0.030
U137	Indeno(1,2,3-c,d)pyrene	K087	0.010	1.08	K087	2.8	0.030
U157	3-Methylcholanthrene	K024	0.10	2.06	K101[a]	2.8	0.58
U165	Naphthalene	X019	0.002	1.20	K019	2.8	0.007
	Naphthalene	K001 (PCP)	0.010	1.12[b]	K001 (PCP)	2.8	0.031
	Pentachlorophenol	K001 (PCP)	0.050	1.25[c]	K001 (PCP)	2.8	0.18
	Phenanthrene	K001 (PCP)	0.010	1.12	K001 (PCP)	2.8	0.031
U051	Pyrene	K001 (PCP)	0.010	1.0	K001 (PCP)	2.8	0.028
	Toluene	K001 (Creosote)	0.010	1.01	K001 (Creosote)	2.8	0.028
	Xylenes	K001 (Creosote)	0.010	1.15[b]	K001 (Creosote)	2.8	0.032

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pcp - pentachlorophenol

[a] Since this constituent was not found in any of the untreated F or K wastes, the correction factor of 2.06 from waste code K101 was determined by selecting the lowest average percent recovery for base-neutral extractable semivolatiles from all the incineration performance data and corresponding recovery data considered for this Third Third rulemaking.

[b] No recovery value was available for this constitutent; hence, the lowest average percent recovery value was used. (Recovery values greater than 100 were considered to be just 100 percent for calculating the average and determining the accuracy-correction factors.)

[c] Recovery values for pentachlorophenol in K001 (PCP) wastewaters were below 20 percent; hence, the Agency chose the recovery value for pentachlorophenol in K001 cresote.

Table 6-3 K001 Creosote Ash Detection Limits

BDAT constituent	Detection limit		Detection limit
BDAT Volatile Organics	(ppm)	BDAT Volatile Organics	(ppm)
Acetonitrile	200	Methyl methanesulfonate	NA
Acrolein	500	Methylacrylonitrile	NA
Acrylonitrile	10	Methylene chloride	50
Benzene	10	1,1,1,2-Tetrachloroethane	10
Bromodichloromethane	10	1,1,2,2-Tetrachloroethane	10
Bromomethane	10	Tetrachloroethene	10
Carbon disulfide	10	Toluene	10
Carbon tetrachloride	10	Tribromomethane	10
Chlorobenzene	10	1,1,1-Trichloroethane	10
Chlorodibromomethane	10	1,1,2-Trichloroethane	10
Chloroethane	10	Trichloroethene	10
Chloroform	10	Trichlorofluoromethane	10
Chloromethane	10	1,2,3-Trichloropropane	10
2-Chloro-1,3-butadiene	NA	Vinyl chloride	10
2-Chloroethyl vinyl ether	100	Ethylbenzene	10
3-Chloropropene	10	Xylenes	10
1,2-Dibromo-3-chloropropene	10	Styrene	10
1,2-Dibromomethane	10	Ethyl ether	NA
Dibromomethane	10	Ethyl acetate	10
Dichlorodifluoromethane	10	Epichlorohydrin	NA
1,1-Dichloroethane	10	Acetone	50
1,2-Dichloroethane	10	Methyl isobutyl ketone	100
1,1-Dichloroethylene	10	Di-n-propylnitrosamine	NA
trans-1,2-Dichloroethane	10	Chlorodifluoromethane	NA
trans-1,4-Dichloro-2-butene	10	1,3-Butadiene	NA
1,2-Dichloropropane	10	Hexachloropentadiene	NA
trans-1,3-Dichloropropene	10	Cumene	NA
cis-1,3-Dichloropropene	10	Benzyl chloride	NA
1,4-Dioxane	NA	Acetaldehyde	NA
Ethyl cyanide	NA	Cyclohexanone	NA
Ethyl methacrylate	50	Dimethyl nitrosamine	NA
Idomethane	20	Methyl acetate	NA
Isobutyl alcohol	NA	Propylene oxide	NA
Methyl ethyl ketone	50	Phthalic anhydride	NA
Methyl methacrylate	50		

Source: Radian Corp. 1987.

Table 6-3 (continued)

BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)
Acenaphthalene	0.23
Acenaphthene	0.13
Acetophenone	0.19
2-Acetylaminofluorene	0.43
4-Aminobiphenyl	20.0
Aniline	0.67
Anthracene	0.13
Aramite	NA
Benz(a)anthracene	0.52
Benzenethiol	NA
Benzidine	2.9
Benzo(a)pyrene	0.17
Benzo(b and/or K)fluoranthene	0.32
Benzo(g,h,i)perylene	0.27
p-Benzoquinone	NA
Bis(2-chloroethoxy)methane	0.36
Bis(2-chloroethyl)ether	0.38
Bis(2-chloroisopropyl)ether	0.38
Bis(2-ethylhexyl)phthalate	0.17
4-Bromophenyl phenyl ether	0.13
Butylbenzylphthalate	0.17
2-sec-Butyl-4,6-dinitrophenol	NA
p-Chloroaniline	0.67
Chlorobenzilate	0.27
p-Chloro-m-cresol	0.20
2-Chloronaphthalene	0.13
2-Chlorophenol	0.22
3-Chloropropionitrile	NA
Chrysene	0.17
ortho-Cresol	0.67
para-Cresol	0.67
Dibenz(a,h)anthracene	0.17
Dibenzo(a,e)pyrene	NA
Dibenzo(a,i)pyrene	NA
m-Dichlorobenzene	0.13
o-Dichlorobenzene	0.13
p-Dichlorobenzene	0.29
3,3'-Dichlorobenzidine	1.1
2,4-Dichlorophenol	0.18
2,6-Dichlorophenol	0.46
Diethylphthalate	0.13
3,3'-Dimethoxybenzidine	NA
p-Dimethylaminoazobenzene	0.23
3,3'-Dimethylbenzidine	0.55
2,4-Dimethylphenol	0.18
Dimethylphthalate	0.11
Semivolatile constituents:	(ppm)
Di-n-butylphthalate	0.17
1,3-Dinitrobenzene	0.17
4,6-Dinitro-o-cresol	1.6
2,4-Dinitrophenol	2.8
2,4-Dinitrotoluene	0.38
2,6-Dinitrotoluene	0.13
Di-n-octylphthalate	0.17
Di-n-propylnitroseamine	0.13
1,2-Diphenylhydrazine	NA
Fluoranthene	0.15
Fluorene	0.13
Hexachlorobenzene	0.13
Hexachlorobutadiene	0.06
Hexachlorocyclopentadiene	0.40
Hexachloroethane	0.11
Hexachlorophene	NA
Hexachloropropene	0.38
Indeno(1,2,3-c,d)pyrene	0.25
Isosafrole	0.10
Methapyrilene	0.80
3-Methylcholanthrene	0.23
4,4'-Methylenebis(2-chloroaniline)	NA
Naphthalene	0.11
1,4-Naphthoquinone	0.08
1-Naphthylamine	0.38
2-Naphthylamine	0.87
p-Nitroaniline	3.4
Nitrobenzene	0.13
4-Nitrophenol	0.16
N-Nitrosodi-n-butylamine	0.21
N-Nitrosodiethylamine	0.18
N-Nitrosodimethylamine	0.67
N-Nitrosomethylethylamine	0.23
N-Nitrosomorpholine	0.23
N-Nitrosopiperidine	0.19
N-Nitrosopyrrolidine	0.28
5-Nitro-o-toluidine	0.17
Pentachlorobenzene	0.10
Pentachloroethane	0.18
Pentachloronitrobenzene	0.17
Pentachlorophenol	0.24
Phenacetin	NA
Phenanthrene	0.30
Phenol	0.10
2-Picoline	0.16

Source: Radian Corp. 1987.

Table 6-3 (continued)

BDAT constituent	Detection limit
Semivolatiles (continued):	(ppm)
Pronamide	0.16
Pyrene	0.13
Resorcinol	NA
Safrole	0.17
1,2,4,5-Tetrachlorobenzene	0.10
2,3,4,6-Tetrachlorophenol	0.46
1,2,4-Trichlorobenzene	0.13
2,4,5-Trichlorophenol	0.67
2,4,6-Trichlorophenol	0.18
Tris(2,3-dibromopropyl)phosphate	NA

NA - The standard is not available; the compound was searched using an NBS library data base of 42,000 compounds.

Source: Radian Corp. 1987.

Table 6-4 K001 Pentachlorophenol Ash Detection Limits

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Volatile constituents:	(ppm)	Volatile constituents:	(ppm)
Acetonitrile	50	1,2-Dichloropropane	5.0
Acrolein	50	Trans-1,3-dichloropropene	5.0
Acrylonitrile	10	cis-1,3-Dichloropropene	5.0
Benzene	2.0	1,4-Dioxane	50
Bromodichloromethane	2.0	Ethyl cyanide	0.1
Bromomethane	2.0	Ethyl methacrylate	2.0
Carbon tetrachloride	2.0	Iodomethane	2.0
Carbon disulfide	2.0	Isobutyl alcohol	0.02
Chlorobenzene	2.0	Methyl ethyl ketone	10
2-Chloro-1,3-butadiene	0.05	Methyl methacrylate	2.0
Chlorodibromomethane	2.0	Methylacrylonitrile	0.02
Chloroethane	2.0	Methylene chloride	10
2-Chloroethyl vinyl ether	0.2	Methyl methane sulfonate	5.0
Chloroform	2.0	1,1,1,2-Tetrachloroethane	2.0
Chloromethane	2.0	1,1,2,2-Tetrachloroethane	2.0
3-Chloropropane	2.0	Tetrachloroethene	2.0
1,2-Dibromo-3-chloropropane	2.0	Toluene	2.0
1,2-Dibromoethane	2.0	Tribromomethane	2.0
Dibromomethane	2.0	1,1,1-Trichloroethane	2.0
Trans-1,4-dichloro-2-butane	0.05	1,1,2-Trichloroethane	2.0
Dichlorodifluoromethane	2.0	Trichloroethene	2.0
1,1-Dichloroethane	2.0	Trichloromonofluoromethane	2.0
1,2-Dichloroethane	2.0	1,2,3-Trichloropropane	50.0
1,1-Dichloroethylene	2.0	Vinyl chloride	2.0
Trans-1,2-dichloroethane	2.0		

Source: USEPA 1987b.

Table 6-4 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)	Semivolatile constituents:	(ppm)
Methyl methanesulfonate	NA	Diethyl phthalate	0.5
Pyridine	5.0	3,3'-Dimethoxybenzidine	500.0
Acenaphthalene	0.5	p-Dimethylaminoazobenzene	10
Acenaphthene	0.5	3,3'-Dimethylbenzidine	500.0
Acetophenone	0.5	2,4-Dimethylphenol	0.5
2-Acetylaminofluorene	50.0	Dimethyl phthalate	0.5
4-Aminobiphenyl	10.0	Di-n-butyl phthalate	0.5
Aniline	1.0	1,4-Dinitrobenzene	5.0
Anthracene	0.5	4,6-Dinitro-o-cresol	2.5
Aramite	--	2,4-Dinitrophenol	2.5
Benz(a)anthracene	0.5	2,4-Dinitrotoluene	0.5
Benzenethiol	--	2,6-Dinitrotoluene	0.5
Benzidine	50.0	Di-n-octyl phthalate	0.5
Benzo(a)pyrene	0.5	Di-n-propylnitrosamine	--
Benzo(b)fluoranthene	0.5	Diphenylamine	0.5
Benzo(g,h,i)perylene	0.5	1,2-Diphenylhydrazine	0.5
Benzo(k)fluoranthene	0.5	Fluoranthene	0.5
p-Benzoquinone	50.0	Fluorene	0.5
Bis(2-chloroethoxy)ethane	0.5	Hexachlorobenzene	0.5
Bis(2-chloroethyl)ether	0.5	Hexachlorobutadiene	0.5
Bis(2-chloroisopropyl)ether	0.5	Hexachlorocyclopentadiene	0.5
Bis(2-ethylhexyl)phthalate	0.5	Hexachloroethane	0.5
4-Bromophenyl phenyl ether	0.5	Hexachlorophene	--
Butylbenzylphthalate	0.5	Hexachloropropane	0.5
2-sec-Butyl-4,6-dinitrophenol	--	Indeno(1,2,3-c,d)pyrene	0.5
p-Chloroaniline	5.0	Isosafrole	--
Chlorobenzilate	--	Methapyrilene	--
p-Chloro-m-cresol	0.5	3-Methylcholanthrene	5.0
2-Chloronaphthalene	0.5	4,4'-Methylenabis(2-chloroaniline)	10.0
2-Chlorophenol	0.5	Naphthalene	0.5
Chrysene	0.5	1,4-Naphthoquinone	0.5
ortho-Cresol	0.5	1-Naphthylamine	5.0
para-Cresol	0.5	2-Naphthylamine	5.0
Dibenz(a,h)anthracene	0.5	p-Nitroaniline	2.5
Dibenzo(a,e)pyrene	0.5	Nitrobenzene	0.5
Dibenzo(a,i)pyrene	0.5	4-Nitrophenol	2.5
m-Dichlorobenzene	0.5	N-Nitrosodi-n-butylamine	5.0
o-Dichlorobenzene	0.5	N-Nitrosodiethylamine	5.0
p-Dichlorobenzene	0.5	N-Nitrosodimethylamine	5.0
3,3'-Dichlorobenzidine	1.0	N-Nitrosomethylethylamine	5.0
2,4-Dichlorophenol	0.5	N-Nitrosomorpholine	10.0
2,6-Dichlorophenol	0.5	N-Nitrosopiperidine	10.0

Source: USEPA 1987b.

Table 6-4 (continued)

BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)
N-Nitrosopyrrolidine	10.0
5-Nitro-o-toluidine	10.0
Pentachlorobenzene	0.5
Pentachloroethane	0.5
Pentachloronitrobenzene	5.0
Pentachlorophenol	2.5
Phenacetin	5.0
Phenanthrene	0.5
Phenol	0.5
2-Picoline	5.0
Pronamide	5.0
Pyrene	0.5
Resorcinol	0.5
Safrole	5.0
1,2,4,5-Tetrachlorobenzene	5.0
2,3,4,6-Tetrachlorophenol	5.0
1,2,4-Trichlorobenzene	0.5
2,4,5-Trichlorophenol	2.5
2,4,6-Trichlorophenol	0.5
Tris(2,3-dibromopropyl)phosphate	--

-- No data available.

Source: USEPA 1987b.

Table 6-5 K019 Ash Detection Limits

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Volatile constituents:	(ppm)	Volatile constituents:	(ppm)
1 Acetonitrile	10	32 Iodomethane	2.0
2 Acrolein	100	33 Isobutyl alcohol	2.0
3 Acrylonitrile	10	34 Methyl ethyl ketone	10
4 Benzene	2.0	35 Methyl methacrylate	2.0
5 Bromodichloromethane	2.0	37 Methylacrylonitrile	10
6 Bromomethane	2.0	38 Methylene chloride	10
7 Carbon tetrachloride	2.0	40 1,1,1,2-Tetrachloroethane	2.0
8 Carbon disulfide	—	41 1,1,2,2-Tetrachloroethane	2.0
9 Chlorobenzene	2.0	42 Tetrachloroethene	2.0
10 2-Chloro-1,3-butadiene	2.0	43 Toluene	2.0
11 Chlorodibromomethane	2.0	44 Tribromomethane	2.0
12 Chloroethane	2.0	45 1,1,1-Trichloroethane	2.0
13 2-Chloroethyl vinyl ether	—	46 1,1,2-Trichloroethane	2.0
14 Chloroform	2.0	47 Trichloroethene	2.0
15 Chloromethane	2.0	48 Trichloromonofluoromethane	2.0
16 3-Chloropropane	2.0	49 1,2,3-Trichloropropane	5.0
17 1,2-Dibromo-3-chloropropane	2.0	50 Vinyl chloride	2.0
18 1,2-Dibromoethane	2.0	79 3-Chloropropionitrile	--
19 Dibromomethane	2.0	* Acetone	10
20 Trans-1,4-dichloro-2-butane	10	* Allyl alcohol	--
21 Dichlorodifluoromethane	2.0	* Ethyl benzene	2.0
22 1,1-Dichloroethane	2.0	* Ethylene oxide	--
23 1,2-Dichloroethane	2.0	* 2-Hexanone	10
24 1,1-Dichloroethylene	2.0	* Malononitrile	--
25 Trans-1,2-dichloroethane	2.0	* 4-Methyl-2-pentanone	10
26 1,2-Dichloropropane	2.0	* 2-Propyn-1-ol	--
27 Trans-1,3-dichloropropene	2.0	* Styrene	2.0
28 cis-1,3-Dichloropropene	2.0	* Trichloromethanethiol	--
29 1,4-Dioxane	—	* Vinly acetate	2.0
30 Ethyl cyanide	100	* Xylene (total)	2.0
31 Ethyl methacrylate	2.0		

Source: USEPA 1988m.

Table 6-5 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)	Semivolatile constituents:	(ppm)
38 Methyl methanesulfonate	10	97 Dimethyl phthalate	2.0
39 Pyridine	20.0	98 Di-n-butyl phthalate	2.0
51 Acenaphthalene	2.0	99 1,4-Dinitrobenzene	10
52 Acenaphthane	2.0	100 4,5-Dinitro-o-cresol	50
53 Acetophenane	2.0	101 2,4-Dinitrophenol	50
54 2-Acetylaminofluorene	—	102 2,4-Dinitrotoluene	50
55 4-Aminobiphenyl	2.0	103 2,5-Dinitrotoluene	10
56 Aniline	5.0	104 Di-n-octyl phthalate	2.0
57 Anthracene	2.0	105 Di-n-propylnitrosemine	5.0
58 Aramite	—	106 Diphenylamine	2.0
59 Benz(a)anthracene	2.0	107 1,2-Diphenylhydrazine	2.0
60 Benzenethiol	—	108 Fluoranthene	2.0
61 Benzidine	2.0	109 Fluorene	2.0
62 Benzo(a)pyrene	2.0	110 Hexachlorobenzene	10
63 Benzo(b)fluoranthene	—	111 Hexachlorobutadiene	10
64 Benzo(g,h,i)perylene	5.0	112 Hexachlorocyclopentadiene	10
65 Benzo(k)fluoranthene	2.0	113 Hexachloroethane	10
66 p-Benzoquinone	—	114 Hexachlorophene	--
67 Bis(2-chloroethoxy)ethane	2.0	115 Hexachloropropane	10
68 Bis(2-chloroethyl)ether	2.0	116 Indeno(1,2,3-c,d)pyrene	5.0
69 Bis(2-chloroisopropyl)ether	2.0	117 Isosafrole	--
70 Bis(2-ethylexyl)phthalate	2.0	118 Methapyrilene	--
71 4-Bromophenyl phenyl ether	10	119 3-Methylcholanthrene	—
72 Butyl benzyl phthalate	2.0	120 4,4'-Methylenabis(2-chloroaniline)	--
73 2-sec-Butyl-4,6-dinitrophenol	—	121 Naphthalene	2.0
74 p-Chloroaniline	5.0	122 1,4-Naphthoquinone	2.0
75 Chlorobenzilate	—	123 1-Naphthylamine	2.0
76 p-Chloro-a-cresol	5.0	124 2-Naphthylamine	2.0
77 2-Chloronaphthalene	2.0	125 p-Nitroaniline	10
78 2-Chlorophenol	2.0	126 Nitrobenzene	5.0
80 Chrysene	2.0	127 4-Nitrophenol	10
81 ortho-Cresol	2.0	128 N-Nitrosodi-n-butylamine	5.0
82 para-Cresol	2.0	129 N-Nitrosodiethylamine	10
83 Dibenz(a,h)anthracene	2.0	130 N-Nitrosodimethylamine	20
84 Dibenzo(a,e)pyrene	—	131 N-Nitrosomethylethylamine	—
85 Dibenzo(a,i)pyrene	—	132 N-Nitrosomorpholine	10
86 m-Dichlorobenzene	2.0	133 N-Nitrosopiperidine	10
87 o-Dichlorobenzene	2.0	134 N-Nitrosopyrrolidine	10
88 p-Dichlorobenzene	2.0	135 5-Nitro-o-toluidine	—
89 3,3'-Dichlorobenzidine	10	136 Pentachlorobenzene	10
90 2,4-Dichlorophenol	5.0	137 Pentachloroethene	10
91 2,6-Dichlorophenol	5.0	138 Pentachloronitrobenzene	10
92 Diethyl phthalate	2.0	139 Pentachlorophenol	50
93 3,3'-Dimethoxybenzidine	10	140 Phenacetin	2.0
94 p-Dimethylaminoezobenzene	5.0	141 Phenanthrene	2.0
95 3,3'-Dimethylbenzidine	—	142 Phenol	2.0
96 2,4-Dimethylphenol	5.0	143 2-Picoline	20

Source: USEPA 1988m.

Table 6-5 (continued)

BDAT constituent	Detection limit
Semivolatiles (continued):	(ppm)
144 Pronamide	10
145 Pyrene	2.0
146 Resorcinol	—
147 Safrole	—
148 1,2,4,5-Tetrachlorobenzene	5.0
149 2,3,4,8-Tetrachlorophenol	10
150 1,2,4-Trichlorobenzene	5.0
151 2,4,5-Trichlorophenol	10
152 2,4,6-Trichlorophenol	10
153 Tris(2,3-dibromopropyl)phosphate	—
* 7,12-Dimethylbenz(a)anthracene	5.0
* alpha,alpha-Dimethylphenethylamine	10
* Benzoic acid	50
* Benzyl alcohol	5.0
* 4-Chlorophenyl phenyl ether	5.0
* Dibenzofuran	2.0
* Dibenzo(a,h)pyrene	—
* Isophorone	2.0
* 2-Methylnaphthalene	2.0
* 2-Nitroaniline	10
* 3-Nitroaniline	10
* 2-Nitrophenol	10
* N-Nitrosodiphenylamine	2.0

BDAT constituent	Detection limit
Metals:	(ppm)
154 Antimony	240
155 Arsenic	2.0
156 Barium	9.0
157 Beryllium	1.0
158 Cadmium	3.0
159 Chromium	9.0
159 Chromium, hexavalent	200
160 Copper	10
161 Lead	80
162 Mercury	0.2
163 Nickel	20
164 Selenium	25
165 Silver	9.0
166 Thallium	2.0
167 Vanadium	20
168 Zinc	6.0
Other constituents:	(ppb)
168 Total cyanide	10
170 Fluoride	5.0
171 Sulfide	1,000
Physical parameters:	(ppb)
Total Solids (% residue)	0.05

— = No data available.

Source: USEPA 1988m.

Table 6-6 K024 Ash Detection Limits

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Volatile constituents:	(ppm)	Volatile constituents:	(ppm)
1 Acetonitrile	-	32 Iodomethane	2.0
2 Acrolein	-	33 Isobutyl alcohol	-
3 Acrylonitrile	-	34 Methyl ethyl ketone	10
4 Benzene	2.0	35 Methyl methacrylate	2.0
5 Bromodichloromethane	2.0	37 Methylacrylonitrile	10
6 Bromomethane	2.0	38 Methylene chloride	50
7 Carbon tetrachloride	2.0	40 1,1,1,2-Tetrachloroethane	2.0
8 Carbon disulfide	-	41 1,1,2,2-Tetrachloroethane	2.0
9 Chlorobenzene	2.0	42 Tetrachloroethene	2.0
10 2-Chloro-1,3-butadiene	-	43 Toluene	2.0
11 Chlorodibromomethane	2.0	44 Tribromomethane	2.0
12 Chloroethane	2.0	45 1,1,1-Trichloroethane	2.0
13 2-Chloroethyl vinyl ether	-	46 1,1,2-Trichloroethane	2.0
14 Chloroform	2.0	47 Trichloroethene	2.0
15 Chloromethane	2.0	48 Trichloromonofluoromethane	2.0
16 3-Chloropropane	2.0	49 1,2,3-Trichloropropane	-
17 1,2-Dibromo-3-chloropropane	2.0	50 Vinyl chloride	2.0
18 1,2-Dibromoethane	2.0	79 3-Chloropropionitrile	
19 Dibromomethane	2.0	* Acetone	50
20 Trans-1,4-dichloro-2-butane	-	* Allyl alcohol	-
21 Dichlorodifluoromethane	2.0	* Ethyl benzene	2.0
22 1,1-Dichloroethane	2.0	* Ethylene oxide	-
23 1,2-Dichloroethane	2.0	* 2-Hexanone	-
24 1,1-Dichloroethylene	2.0	* Malononitrile	-
25 Trans-1,2-dichloroethane	2.0	* 4-Methyl-2-pentanone	-
26 1,2-Dichloropropane	5.0	* 2-Propyn-1-ol	-
27 Trans-1,3-dichloropropene	5.0	* Styrene	2.0
28 cis-1,3-Dichloropropene	5.0	* Trichloromethanethiol	-
29 1,4-Dioxane	100	* Vinyl acetate	-
30 Ethyl cyanide	-	* Xylene (total)	2.0
31 Ethyl methacrylate	2.0		

Source: USEPA 1987a.

Table 6-6 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)	Semivolatile constituents:	(ppm)
38 Methyl methanesulfonate	-	97 Dimethyl phthalate	0.5
39 Pyridine	-	98 Di-n-butyl phthalate	0.5
51 Acenaphthalene	0.5	99 1,4-Dinitrobenzene	5.0
52 Acenaphthane	0.5	100 4,5-Dinitro-o-cresol	2.5
53 Acetophenane	0.5	101 2,4-Dinitrophenol	2.5
54 2-Acetylaminofluorene	50	102 2,4-Dinitrotoluene	0.5
55 4-Aminobiphenyl	20	103 2,6-Dinitrotoluene	0.5
56 Aniline	1.0	104 Di-n-octyl phthalate	0.5
57 Anthracene	0.5	105 Di-n-propylnitrosamine	-
58 Aramite	-	106 Diphenylamine	0.5
59 Benz(a)anthracene	0.5	107 1,2-Diphenylhydrazine	0.5
60 Benzenethiol	-	108 Fluoranthene	0.5
61 Benzidine	50	109 Fluorene	0.5
62 Benzo(a)pyrene	0.5	110 Hexachlorobenzene	0.5
63 Benzo(b)fluoranthene	0.5	111 Hexachlorobutadiene	0.5
64 Benzo(g,h,i)perylene	0.5	112 Hexachlorocyclopentadiene	0.5
65 Benzo(k)fluoranthene	0.5	113 Hexachloroethane	0.5
66 p-Benzoquinone	50	114 Hexachlorophene	-
67 Bis(2-chloroethoxy)ethane	0.5	115 Hexachloropropene	0.5
68 Bis(2-chloroethyl)ether	0.5	116 Indeno(1,2,3-c,d)pyrene	0.5
69 Bis(2-chloroisopropyl)ether	0.5	117 Isosafrole	5.0
70 Bis(2-ethylexyl)phthalate	0.5	118 Methapyrilene	-
71 4-Bromophenyl phenyl ether	0.5	119 3-Methylcholanthrene	5.0
72 Butyl benzyl phthalate	0.5	120 4,4'-Methylenabis(2-chloroaniline)	10
73 2-sec-Butyl-4,6-dinitrophenol	-	121 Naphthalene	0.5
74 p-Chloroaniline	5.0	122 1,4-Naphthoquinone	5.0
75 Chlorobenzilate	-	123 1-Naphthylamine	-
76 p-Chloro-a-cresol	0.5	124 2-Naphthylamine	5.0
77 2-Chloronaphthalene	0.5	125 p-Nitroaniline	2.5
78 2-Chlorophenol	0.5	126 Nitrobenzene	0.5
80 Chrysene	0.5	127 4-Nitrophenol	2.5
81 ortho-Cresol	0.5	128 N-Nitrosodi-n-butylamine	5.0
82 para-Cresol	0.5	129 N-Nitrosodiethylamine	5.0
83 Dibenz(a,h)anthracene	0.5	130 N-Nitrosodimethylamine	5.0
84 Dibenzo(a,e)pyrene	-	131 N-Nitrosomethylethylamine	5.0
85 Dibenzo(a,i)pyrene	-	132 N-Nitrosomorpholine	20
86 m-Dichlorobenzene	0.5	133 N-Nitrosopiperidine	20
87 o-Dichlorobenzene	0.5	134 N-Nitrosopyrrolidine	20
88 p-Dichlorobenzene	0.5	135 5-Nitro-o-toluidine	20
89 3,3'-Dichlorobenzidine	1.0	136 Pentachlorobenzene	0.5
90 2,4-Dichlorophenol	0.5	137 Pentachloroethane	0.5
91 2,6-Dichlorophenol	0.5	138 Pentachloronitrobenzene	5.0
92 Diethyl phthalate	0.5	139 Pentachlorophenol	2.5
93 3,3'-Dimethoxybenzidine	500	140 Phenacetin	0.5
94 p-Dimethylaminoazobenzene	10	141 Phenanthrene	0.5
95 3,3'-Dimethylbenzidine	500	142 Phenol	0.5
96 2,4-Dimethylphenol	0.5	143 2-Picoline	5.0

Source: USEPA 1987a.

Table 6-6 (continued)

BDAT constituent	Detection limit
Semivolatiles (continued):	(ppm)
144 Pronamide	5.0
145 Pyrene	0.5
146 Resorcinol	0.5
147 Safrole	5.0
148 1,2,4,5-Tetrachlorobenzene	5.0
149 2,3,4,8-Tetrachlorophenol	5.0
150 1,2,4-Trichlorobenzene	0.5
151 2,4,5-Trichlorophenol	2.5
152 2,4,6-Trichlorophenol	0.5
153 Tris(2,3-dibromopropyl)phosphate	-
* 7,12-Dimethylbenz(a)anthracene	-

- Detection limit data not given.
* Not a BDAT list constituent.

Source: USEPA 1987a.

Table 6-7 K087 Ash Detection Limits

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5
BDAT Volatile Organics (ppb)					
Acetone	50	50	50	50	50
Acetonitrile	500	500	500	500	500
Acrolein	500	500	500	500	500
Acrylonitrile	500	500	500	500	500
Benzene	25	25	25	25	25
Bromodichloromethane	25	25	25	25	25
Bromomethane	50	50	50	50	50
Carbon tetrachloride	25	25	25	25	25
Carbon disulfide	25	25	25	25	25
Chlorobenzene	25	25	25	25	25
2-Chloro-1,3-butadiene	500	500	500	500	500
Chlorodibromomethane	25	25	25	25	25
Chloroethane	50	50	50	50	50
2-Chloroethyl vinyl ether	50	50	50	50	50
Chloroform	25	25	25	25	25
Chloromethane	50	50	50	50	50
3-Chloropropene	500	500	500	500	500
1,2-Dibromo-3-chloropropane	50	50	50	50	50
1,2-Dibromomethane	25	25	25	25	25
Dibromomethane	25	25	25	25	25
trans-1,4-Dichloro-2-butene	500	500	500	500	500
Dichlorodifluoromethane	50	50	50	50	50
1,1-Dichloroethane	25	25	25	25	25
1,2-Dichloroethane	25	25	25	25	25
1,1-Dichloroethylene	25	25	25	25	25
trans-1,2-Dichloroethene	25	25	25	25	25
1,2-Dichloropropane	25	25	25	25	25
trans-1,3-Dichloropropene	25	25	25	25	25
cis-1,3-Dichloropropene	25	25	25	25	25
1,4-Dioxane	1000	1000	1000	1000	1000
Ethyl benzene	25	25	25	25	25
Ethyl cyanide	500	500	500	500	500
Ethyl methacrylate	500	500	500	500	500
Ethylene oxide	2000	2000	2000	2000	2000
Iodomethane	250	250	250	250	250
Isobutyl alcohol	1000	1000	1000	1000	1000
Methyl ethyl ketone	25	25	25	25	25
Methyl isobutyl ketone	25	25	25	25	25
Methyl methacrylate	500	500	500	500	500
Methylacrylonitrile	500	500	500	500	500
Methylene chloride	25	25	25	25	25
Pyridine	2000	2000	2000	2000	2000

Source: USEPA 1988l.

Table 6-7 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5
BDAT Volatile Organics (ppb) (continued)					
1,1,1,2-Tetrachloroethane	25	25	25	25	25
1,1,2,2-Tetrachloroethane	25	25	25	25	25
Tetrachloroethene	25	25	25	25	25
Toluene	25	25	25	25	25
Tribromomethane	25	25	25	25	25
1,1,1-Trichloroethane	25	25	25	25	25
1,1,2-Trichloroethane	25	25	25	25	25
Trichloroethene	25	25	25	25	25
Trichloromonofluoromethane	25	25	25	25	25
1,2,3-Trichloropropane	25	25	25	25	25
Vinyl chloride	50	50	50	50	50
Xylenes	25	25	25	25	25
BDAT Semivolatile Organics (ppb)					
Acenaphthalene	1000	1000	1000	1000	1000
Acenaphthene	1000	1000	1000	1000	1000
Acetophenone	2000	2000	2000	2000	2000
2-Acetylaminofluorene	2000	2000	2000	2000	2000
4-Aminobiphenyl	2000	2000	2000	2000	2000
Aniline	1000	1000	1000	1000	1000
Anthracene	1000	1000	1000	1000	1000
Aramite					
Benz(a)anthracene	1000	1000	1000	1000	1000
Benzenethiol					
Benzidine	5000	5000	5000	5000	5000
Benzo(a)pyrene	1000	1000	1000	1000	1000
Benzo(b)fluoranthene	1000	1000	1000	1000	1000
Benzo(ghi)perylene	1000	1000	1000	1000	1000
Benzo(k)fluoranthene	1000	1000	1000	1000	1000
p-Benzoquinone					
Bis(2-chloroethoxy)ethane	1000	1000	1000	1000	1000
Bis(2-chloroethyl)ether	1000	1000	1000	1000	1000
Bis(2-chloropropyl)ether	1000	1000	1000	1000	1000
Bis(2-ethylhexyl)phthalate	1000	1000	1000	1000	1000
4-Bromophenyl phenyl ether	1000	1000	1000	1000	1000
Butyl benzyl phthalate	1000	1000	1000	1000	1000

Source: USEPA 1988l.

Table 6-7 (continued)

Constituent/parameter (units)	Detection limit Sample Set #				
	1	2	3	4	5
BDAT Semivolatile Organics (ppb) (continued)					
2-sec-Butyl-4,6-dinitrophenol	5000	5000	5000	5000	5000
p-Chloroaniline	1000	1000	1000	1000	1000
Chlorobenzilate					
p-Chloro-m-cresol	1000	1000	1000	1000	1000
2-Chloronaphthalene	1000	1000	1000	1000	1000
2-Chlorophenol	1000	1000	1000	1000	1000
3-Chloropropionitrile					
Chrysene	1000	1000	1000	1000	1000
ortho-Cresol	1000	1000	1000	1000	1000
para-Cresol	1000	1000	1000	1000	1000
Dibenz(a,h)anthracene	1000	1000	1000	1000	1000
Dibenzo(a,e)pyrene					
Dibenzo(a,i)pyrene					
m-Dichlorobenzene	1000	1000	1000	1000	1000
o-Dichlorobenzene	1000	1000	1000	1000	1000
p-Dichlorobenzene	1000	1000	1000	1000	1000
3,3'-Dichlorobenzidine	2000	2000	2000	2000	2000
2,4-Dichlorophenol	1000	1000	1000	1000	1000
2,6-Dichlorophenol					
Diethyl phthalate	1000	1000	1000	1000	1000
3,3'-Dimethoxybenzidine	1000	1000	1000	1000	1000
p-Dimethylaminoazobenzene	2000	2000	2000	2000	2000
3,3'-Dimethylbenzidine					
2,4-Dimethylphenol	1000	1000	1000	1000	1000
Dimethyl phthalate	1000	1000	1000	1000	1000
Di-n-butyl phthalate	1000	1000	1000	1000	1000
1,4-Dinitrobenzene	5000	5000	5000	5000	5000
4,6-Dinitro-o-cresol	5000	5000	5000	5000	5000
2,4-Dinitrophenol	5000	5000	5000	5000	5000
2,4-Dinitrotoluene	1000	1000	1000	1000	1000
2,6-Dinitrotoluene	1000	1000	1000	1000	1000
Di-n-octyl phthalate	1000	1000	1000	1000	1000
Di-n-octyl phthalate	1000	1000	1000	1000	1000
Diphenylamine/ diphenylnitrosamine	2000	2000	2000	2000	2000
1,2-Diphenylhydrazine	5000	5000	5000	5000	5000
Fluoranthene	1000	1000	1000	1000	1000
Fluorene	1000	1000	1000	1000	1000

Source: USEPA 1988l.

Table 6-7 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5
BDAT Semivolatile Organics (ppb) (continued)					
Hexachlorobenzene	1000	1000	1000	1000	1000
Hexachlorobutadiene	1000	1000	1000	1000	1000
Hexachlorocyclopentadiene	1000	1000	1000	1000	1000
Hexachloroethane	1000	1000	1000	1000	1000
Hexachlorophene					
Hexachloropropene					
Indeno(1,2,3-cd)pyrene	1000	1000	1000	1000	1000
Isosafrole	2000	2000	2000	2000	2000
Methapyrilene					
3-Methylcholanthrene	2000	2000	2000	2000	2000
4,4'-Methylenebis(2-chloroaniline)	2000	2000	2000	2000	2000
Methyl methanesulfonate					
Naphthalene	1000	1000	1000	1000	1000
1,4-Naphthoquinone					
1-Naphthylamine	5000	5000	5000	5000	5000
2-Naphthylamine	5000	5000	5000	5000	5000
p-Nitroaniline	5000	5000	5000	5000	5000
Nitrobenzene	1000	1000	1000	1000	1000
4-Nitrophenol	5000	5000	5000	5000	5000
N-Nitrosodi-n-butylamine					
N-Nitrosodiethylamine					
N-Nitrosodimethylamine	1000	1000	1000	1000	1000
N-Nitrosomethylethylamine	1000	1000	1000	1000	1000
N-Nitrosomorpholine	2000	2000	2000	2000	2000
N-Nitrosopiperidine	1000	1000	1000	1000	1000
N-Nitrosopyrrolidine	5000	5000	5000	5000	5000
5-Nitro-o-toluidine	2000	2000	2000	2000	2000
Pentachlorobenzene					
Pentachloroethane					
Pentachloronitrobenzene	10000	10000	10000	10000	10000
Pentachlorophenol	5000	5000	5000	5000	5000
Phenacetin	2000	2000	2000	2000	2000
Phenanthrene	1000	1000	1000	1000	1000
Phenol	1000	1000	1000	1000	1000
2-Picoline	1000	1000	1000	1000	1000
Pronamide					
Pyrene	1000	1000	1000	1000	1000
Resorcinol					
Safrole	5000	5000	5000	5000	5000

Source: USEPA 1988l.

Table 6-7 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5
BDAT Semivolatile Organics (ppb) (continued)					
1,2,4,5-Tetrachlorobenzene	2000	2000	2000	2000	2000
2,3,4,6-Tetrachlorophenol					
1,2,4-Trichlorobenzene	1000	1000	1000	1000	1000
2,4,5-Trichlorophenol	5000	5000	5000	5000	5000
2,4,6-Trichlorophenol	1000	1000	1000	1000	1000
Tris(2,3-dibromopropyl)phosphate					
BDAT Metals Other Than Metals (ppb)					
Antimony	3.2	2.0	2.0	2.0	3.2
Arsenic	1.0	1.0	1.0	1.0	1.0
Barium	0.10	20	20	20	0.10
Beryllium	0.10	0.5	0.5	0.5	0.10
Cadmium	0.40	1.0	1.0	1.0	0.40
Chromium	0.70	2.0	2.0	2.0	0.70
Copper	0.60	2.5	2.5	2.5	0.60
Lead	0.50	1.0	1.0	1.0	0.50
Mercury	0.10	0.05	0.05	0.05	0.10
Nickel	1.1	4.0	4.0	4.0	1.1
Selenium	0.50	0.50	0.50	0.50	0.50
Silver	0.60	5.0	5.0	5.0	0.60
Thallium	1.0	1.0	1.0	1.0	1.0
Vanadium	0.60	5.0	5.0	5.0	0.60
Zinc	0.20	2.5	2.5	2.5	0.20
BDAT TCLP: Metals (ppb)					
Antimony	32	20	20	20	32
Arsenic	10	10	10	10	10
Barium	1.0	200	200	200	1.0
Beryllium	1.0	5.0	5.0	5.0	1.0
Cadmium	4.0	10	10	10	4.0
Chromium	7.0	20	20	20	7.0
Copper	6.0	25	25	25	6.0
Lead	5.0	1.0	1.0	1.0	5.0
Mercury	0.20	0.30	0.30	0.30	0.20

Source: USEPA 1988l.

Table 6-8 K001 Creosote Scrubber Water Detection Limits

BDAT constituent	Detection limit	BDAT constituent	Detection limit
BDAT Volatile Organics	(ppb)	BDAT Volatile Organics	(ppb)
Acetonitrile	200	Methyl methanesulfonate	NA
Acrolein	500	Methylacrylonitrile	NA
Acrylonitrile	10	Methylene chloride	50
Benzene	10	1,1,1,2-Tetrachloroethane	10
Bromodichloromethane	10	1,1,2,2-Tetrachloroethane	10
Bromomethane	10	Tetrachloroethene	10
Carbon disulfide	10	Toluene	10
Carbon tetrachloride	10	Tribromomethane	10
Chlorobenzene	10	1,1,1-Trichloroethane	10
Chlorodibromomethane	10	1,1,2-Trichloroethane	10
Chloroethane	10	Trichloroethene	10
Chloroform	10	Trichlorofluoromethane	10
Chloromethane	10	1,2,3-Trichloropropane	10
2-Chloro-1,3-butadiene	NA	Vinyl chloride	10
2-Chloroethyl vinyl ether	100	Ethylbenzene	10
3-Chloropropene	10	Xylenes	10
1,2-Dibromo-3-chloropropene	10	Styrene	10
1,2-Dibromomethane	10	Ethyl ether	NA
Dibromomethane	10	Ethyl acetate	10
Dichlorodifluoromethane	10	Epichlorohydrin	NA
1,1-Dichloroethane	10	Acetone	50
1,2-Dichloroethane	10	Methyl isobutyl ketone	100
1,1-Dichloroethylene	10	Di-n-propylnitroaoamine	NA
trans-1,2-Dichloroethane	10	Chlorodifluoromethane	NA
trans-1,4-Dichloro-2-butene	10	1,3-Butadiene	NA
1,2-Dichloropropane	10	Hexachloropentadiene	NA
trans-1,3-Dichloropropene	10	Cumene	NA
cis-1,3-Dichloropropene	10	Benzyl chloride	NA
1,4-Dioxane	NA	Acetaldehyde	NA
Ethyl methacrylate	50	Cyclohexanone	NA
Idomethane	20	Dimethyl nitroaoamine	NA
Isobutyl alcohol	NA	Methyl acetate	NA
Methyl ethyl ketone	50	Propylene oxide	NA
Methyl methacrylate	50	Phthalic anhydride	NA

Source: Radian Corp. 1987

Table 6-8 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppb)	Semivolatile constituents:	(ppb)
Methyl methanesulfonate	-	p-Dimethylaminoezobenzene	3.0
Pyridine	-	3,3'-Dimethylbenzidine	-
Acenaphthylene	4.0	2,4-Dimethylphenol	3.0
Acenaphthene	2.0	Dimethylphthalate	2.0
Acetophenone	3.0	Di-n-butyl phthalate	3.0
2-Acetylaminofluorene	6.0	1,3-Dinitrobenzene	3.0
4-Aminobiphenyl	3.0	4,6-Dinitro-o-cresol	25.0
Aniline	11.0	2,4-Dinitrophenol	44.0
Anthracene	2.0	2,4-Dinitrotoluene	6.0
Aramite	-	2,6-Dinitrotoluene	2.0
Benz(a)anthracene	8.0	Di-n-octylphthalate	3.0
Benzenethiol	-	Di-n-propylnitrosamine	2.0
Benzidine	50.0	1,2-Diphenylhydrazine	-
Benzo(a)pyrene	3.0	Fluoranthene	2.0
Benzo(b)fluoranthene	5.0	Fluorene	2.0
Benzo(g,h,i)perylene	4.0	Hexachlorobenzene	2.0
Benzo(k)fluoranthene	5.0	Hexachlorobutadiene	1.0
p-Benzoquinone	-	Hexachlorocyclopentadiene	6.0
Bis(2-chloroethoxy)methane	6.0	Hexachloroethane	2.0
Bis(2-chloroethyl)ether	6.0	Hexachlorophene	-
Bis(2-chloroisopropyl)ether	6.0	Hexachloropropene	6.0
Bis(2-ethylmexyl)phthalate	3.0	Indeno(1,2,3-c,d)pyrene	4.0
4-Bromophenyl phenyl ether	2.0	Isosafrole	2.0
Butylbenzylphthalate	3.0	Methapyrilene	12.0
2-sec-Butyl-4,6-dinitrophenol	-	3-Methylcholanthrene	4.0
p-Chloroaniline	11.0	4,4'-Methylenabis(2-chloroaniline)	-
Chlorobenzilate	4.0	Naphthalene	2.0
p-Chloro-m-cresol	-	1,4-Naphthoquinone	1.0
2-Chloronaphthalene	2.0	1-Naphthylamine	6.0
2-Chlorophenol	4.0	2-Naphthylamine	13.0
Chrysene	3.0	p-Nitroaniline	52.0
ortho-Cresol	11.0	Nitrobenzene	2.0
para-Cresol	11.0	4-Nitrophenol	3.0
Dibenz(a,h)anthracene	3.0	N-Nitrosodi-n-butylamine	3.0
Dibenzo(a,e)pyrene	-	N-Nitrosodiethylamine	3.0
Dibenzo(a,i)pyrene	-	N-Nitrosodimethylamine	11.0
m-Dichlorobenzene	2.0	N-Nitrosomethylethylamine	4.0
o-Dichlorobenzene	2.0	N-Nitrosomorpholine	3.0
p-Dichlorobenzene	5.0	N-Nitrosopiperidine	3.0
3,3'-Dichlorobenzidine	17.0	N-Nitrosopyrrolidine	4.0
2,4-Dichlorophenol	3.0	5-Nitro-o-toluidine	3.0
2,6-Dichlorophenol	7.0	Pentachlorobenzene	2.0
Diethyl phthalate	2.0	Pentachloroethane	2.0
3,3'-Dimethoxybenzidine	-		

- = No data available

Source: Radian Corp. 1987.

Table 6-8 (continued)

BDAT constituent	Detection limit
Semivolatiles (continued):	(ppb)
Pentachloronitrobenzene	3.0
Pentachlorophenol	4.0
Phenacetin	-
Penanthrene	6.0
Phenol	2.0
2-Picoline	2.0
Pronamide	2.0
Pyrene	2.0
Resorcinol	-
Safrole	-
1,2,4,5-Tetrachlorobenzene	2.0
2,3,4,6-Tetrachlorophenol	7.0
1,2,4-Trichlorobenzene	2.0
2,4,5-Trichlorophenol	11.0
2,4,6-Trichlorophenol	3.0
Tris(2,3-dibromopropyl)phosphate	-
7,12-Dimethylbenz(a)anthracene	-

Source: Radian Corp. 1987.

Table 6-9 K001 Pentachlorophenol Scrubber Water Detection Limits

BDAT constituent	Detection limit
BDAT Volatile Organics	(ppb)
Acetonitrile	1.0
Acrolein	2.0
Acrylonitrile	2.0
Benzene	2.0
Bromodichloromethane	2.0
Bromomethane	2.0
Carbon disulfide	2.0
Carbon tetrachloride	2.0
Chlorobenzene	2.0
Chlorodibromomethane	2.0
Chloroethane	2.0
Chloroform	2.0
Chloromethane	2.0
2-Chloro-1,3-butadiene	0.05
2-Chloroethyl vinyl ether	0.2
3-Chloropropene	2.0
1,2-Dibromo-3-chloropropene	2.0
1,2-Dibromomethane	2.0
Dibromomethane	2.0
Dichlorodifluoromethane	2.0
1,1-Dichloroethane	2.0
1,2-Dichloroethane	2.0
1,1-Dichloroethylene	2.0
trans-1,2-Dichloroethane	2.0
trans-1,4-Dichloro-2-butene	0.05
1,2-Dichloropropane	5.0
trans-1,3-Dichloropropene	5.0
cis-1,3-Dichloropropene	5.0
1,4-Dioxane	50
Ethyl methacrylate	2.0
Idomethane	2.0
Isobutyl alcohol	0.2
Methyl ethyl ketone	10
Methyl methacrylate	2.0
BDAT Volatile Organics	(ppb)
Methyl methane sulfonate	5.0
Methylacrylonitrile	0.2
Methylene chloride	10
1,1,1,2-Tetrachloroethane	2.0
1,1,2,2-Tetrachloroethane	2.0
Tetrachloroethene	2.0
Toluene	2.0
Tribromomethane	2.0
1,1,1-Trichloroethane	2.0
1,1,2-Trichloroethane	2.0
Trichloroethene	2.0
Trichlorofluoromethane	2.0
1,2,3-Trichloropropane	50
Vinyl chloride	2.0
Ethylbenzene	2.0
Xylenes	2.0
Styrene	2.0
Ethyl ether	50
Ethyl acetate	2.0
Epichlorohydrin	2.0
Acetone	50
Methyl isobutyl ketone	10

Source: USEPA 1987b.

Table 6-9 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppb)	Semivolatile constituents:	(ppb)
Methyl methanesulfonate[b]	--	3,3'-Dimethylbenzidine	10,000
Pyridine[b]	--	2,4-Dimethylphenol	10
Acenaphthalene	10	Dimethylphthalate	10
Acenaphthene	10	Di-n-butylphthalate	10
Acetophenone	10	1,4-Dinitrobenzene	100
2-Acetylaminofluorene	1,000	4,6-Dinitro-o-cresol	50
4-Aminobiphenyl	200	2,4-Dinitrophenol	50
Aniline	20	2,4-Dinitrotoluene	50
Anthracene	10	2,6-Dinitrotoluene	10
Aramite	--	Di-n-octylphthalate	10
Benz(a)anthracene	2	Di-n-propylnitrosamine	--
Benzenethiol	--	Diphenylamine	10
Benzidine	1,000	1,2-Diphenylhydrazine	10
Benzo(a)pyrene	10	Fluoranthene	10
Benzo(b)fluoranthrene	10	Fluorene	10
Benzo(g,h,i)perylene	10	Hexachlorobenzene	10
Benzo(k)fluoranthrene	10	Hexachlorobutadiene	10
p-Benzoquinone	1,000	Hexachlorocyclopentadiene	10
Bis(2-chloroethoxy)ethane	10	Hexachloroethane	10
Bis(2-chloroethyl)ether	10	Hexachlorophene	--
Bis(2-chloroisopropyl)ether	10	Hexachloropropene	10
Bis(2-ethylhexyl)phthalate	10	Indeno(1,2,3-c,d)pyrene	10
4-Bromophenyl phenyl ether	10	Isosafrole	100
Butylbenzylphthalate	10	Methapyrilene	--
2-sec-Butyl-4,6-dinitrophenol	--	3-Methylcholanthrene	100
p-Chloroaniline	100	4,4'-Methylenebis(2-chloroaniline)	200
Chlorobenzilate	NA	Naphthalene	10
p-Chloro-m-cresol	10	1,4-Naphthoquinone	100
2-Chloronaphthalene	10	1-Naphthylamine	100
2-Chlorophenol	10	2-Naphthylamine	100
3-Chloropropronitrile	--	p-Nitroaniline	50
Chrysene	10	Nitrobenzene	10
ortho-Cresol	10	4-Nitrophenol	50
para-Cresol	10	N-Nitrosodi-n-butylamine	100
Dibenz(a,h)anthracene	10	N-Nitrosodiethylamine	100
Dibenzo(a,e)pyrene	10	N-Nitrosodimethylamine	100
Dibenzo(a,i)pyrene	10	N-Nitrosomethylamine	100
m-Dichlorobenzene	10		

Source: USEPA 1987b

Table 6-9 (continued)

BDAT constituent	Detection limit
Semivolatiles (continued):	(ppb)
o-Dichlorobenzene	10
p-Dichlorobenzene	10
3,3'-Dichlorobenzidine	20
2,4-Dichlorophenol	10
2,6-Dichlorophenol	10
Diethylphthalate	10
3,3'-Dimethoxybenzidine	10,000
N-Nitrosodi-n-propylamine	100
N-Nitrosomorpholine	200
N-Nitrosopiperidine	200
N-Nitrosopyrrolidine	200
5-Nitro-o-toluidine	200
Pentachlorobenzene	10
Pentachloroethane	10
Pentachloronitrobenzene	100
Pentachlorophenol	50
p-Dimethylaminoazobenzene	200
Phenacetin	100
Phenanthrene	10
Phenol	10
2-Picoline	100
Pronamide	100
Pyrene	10
Resorcinol	10
Safrole	100
1,2,4,5-Tetrachlorobenzene	100
2,3,4,6-Tetrachlorophenol	100
1,2,4-Trichlorobenzene	10
2,4,5-Trichlorophenol	50
2,4,6-Trichlorophenol	10
Tris(2,3-dibromopropyl)phosphate	--

-- = No data available.

Source: USEPA 1987b.

Table 6-10 Combustion Gas Scrubber Discharge Water BDAT List Constituent Detection Limits for K019

	BDAT constituent	Detection limit		BDAT constituent	Detection limit
	Volatile constituents:	(ppb)		Volatile constituents:	(ppb)
1	Acetonitrile	10	32	Iodomethane	2.0
2	Acrolein	100	33	Isobutyl alcohol	2.0
3	Acrylonitrile	10	34	Methyl ethyl ketone	10
4	Benzene	2.0	35	Methyl methacrylate	2.0
5	Bromodichloromethane	2.0	37	Methylacrylonitrile	10
6	Bromomethane	2.0	38	Methylene chloride	10
7	Carbon tetrachloride	2.0	40	1,1,1,2-Tetrachloroethane	2.0
8	Carbon disulfide	NA	41	1,1,2,2-Tetrachloroethane	2.0
9	Chlorobenzene	2.0	42	Tetrachloroethene	2.0
10	2-Chloro-1,3-butadiene	2.0	43	Toluene	2.0
11	Chlorodibromomethane	2.0	44	Tribromomethane	2.0
12	Chloroethane	2.0	45	1,1,1-Trichloroethane	2.0
13	2-Chloroethyl vinyl ether	NA	46	1,1,2-Trichloroethane	2.0
14	Chloroform	2.0	47	Trichloroethene	2.0
15	Chloromethane	2.0	48	Trichloromonofluoromethane	2.0
16	3-Chloropropane	2.0	49	1,2,3-Trichloropropane	5.0
17	1,2-Dibromo-3-chloropropane	2.0	50	Vinyl chloride	2.0
18	1,2-Dibromoethane	2.0	79	3-Chloropropionitrile	NA
19	Dibromomethane	2.0	*	Acetone	10
20	Trans-1,4-dichloro-2-butane	10	*	Allyl alcohol	NA
21	Dichlorodifluoromethane	2.0	*	Ethyl benzene	2.0
22	1,1-Dichloroethane	2.0	*	Ethylene oxide	NA
23	1,2-Dichloroethane	2.0	*	2-Hexanone	10
24	1,1-Dichloroethylene	2.0	*	Malononitrile	NA
25	Trans-1,2-dichloroethane	2.0	*	4-Methyl-2-pentanone	10
26	1,2-Dichloropropane	5.0	*	2-Propyn-1-ol	NA
27	Trans-1,3-dichloropropene	5.0	*	Styrene	2.0
28	cis-1,3-Dichloropropene	5.0	*	Trichloromethanethiol	NA
29	1,4-Dioxane	NA	*	Vinly acetate	2.0
30	Ethyl cyanide	100	*	Xylene (total)	2.0
31	Ethyl methacrylate	2.0			

Table 6-10 (continued) COMBUSTION GAS SCRUBBER DISCHARGE WATER BDAT LIST CONSTITUENT DETECTION LIMITS for KO

BDAT CONSTITUENT	DETECTION LIMIT	BDAT CONSTITUENT	DETECTION LI
SEMIVOLATILE CONSTITUENTS:	(ppb)	SEMIVOLATILE CONSTITUENTS:	(ppb)
38 Methyl methanesulfonate ↔	10	97 Dimethyl phthalate	2
39 Pyridine ↔	20	98 Di-n-butyl phthalate	2
51 Acenaphthalene	2	99 1,4-Dinitrobenzene	10
52 Acenaphthene	2	100 4,6-Dinitro-o-cresol	50
53 Acetophenone	2	101 2,4-Dinitrophenol	50
54 2-Acetylaminofluorene	NA	102 2,4-Dinitrotoluene	50
55 4-Aminobiphenyl	2	103 2,6-Dinitrotoluene	10
56 Aniline	5	104 Di-n-octyl phthalate	2
57 Anthracene	2	105 Di-n-propylnitrosamine	5
58 Aramite	NA	106 Diphenylamine	2
59 Benz(a)anthracene	2	107 1,2-Diphenylhydrazine	2
60 Benzenethiol	NA	108 Fluoranthene	2
61 Benzidine	2	109 Fluorene	2
62 Benzo(a)pyrene	2	110 Hexachlorobenzene	10
63 Benzo(b)fluoranthene	NA	111 Hexachlorobutadiene	10
64 Benzo(g,h,i)perylene	5	112 Hexachlorocyclopentadiene	10
65 Benzo(k)fluoranthene	2	113 Hexachloroethane	10
66 p-Benzoquinone	NA	114 Hexachlorophene	NA
67 Bis(2-chloroethoxy)ethane	2	115 Hexachloropropene	10
68 Bis(2-chloroethyl)ether	2	116 Indeno(1,2,3-c,d)pyrene	5
69 Bis(2-chloroisopropyl)ether	2	117 Isosafrole	NA
70 Bis(2-ethylhexyl)phthalate	2	118 Methapyrilene	NA
71 4-Bromophenyl phenyl ether	10	119 3-Methylcholanthrene	NA
72 Butyl benzyl phthalate	2	120 4,4'-Methylenebis(2-chloroaniline)	NA
73 2-sec-Butyl-4,6-dinitrophenol	NA	121 Naphthalene	2
74 p-Chloroaniline	5	122 1,4-Naphthoquinone	2
75 Chlorobenzilate	NA	123 1-Naphthylamine	2
76 p-Chloro-m-cresol	5	124 2-Naphthylamine	2
77 2-Chloronaphthalene	2	125 p-Nitroaniline	10
78 2-Chlorophenol	2	126 Nitrobenzene	5
80 Chrysene	2	127 4-Nitrophenol	10
81 ortho-Cresol	2	128 N-Nitrosodi-n-butylamine	5
82 para-Cresol	2	129 N-Nitrosodiethylamine	10
83 Dibenz(a,h)anthracene	2	130 N-Nitrosodimethylamine	20
84 Dibenzo(a,e)pyrene	NA	131 N-Nitrosomethylethylamine	NA
85 Dibenzo(a,i)pyrene	NA	132 N-Nitrosomorpholine	10
86 m-Dichlorobenzene	2	133 N-Nitrosopiperidine	10
87 o-Dichlorobenzene	2	134 N-Nitrosopyrrolidine	10
88 p-Dichlorobenzene	2	135 5-Nitro-o-toluidine	NA
89 3,3'-Dichlorobenzidine	10	136 Pentachlorobenzene	10
90 2,4-Dichlorophenol	5	137 Pentachloroethane	10
91 2,6-Dichlorophenol	5	138 Pentachloronitrobenzene	10
92 Diethyl phthalate	2	139 Pentachlorophenol	50
93 3,3'-Dimethoxybenzidine	10	140 Phenacetin	2
94 p-Dimethylaminoazobenzene	5	141 Phenanthrene	2
95 3,3'-Dimethylbenzidine	NA	142 Phenol	2
96 2,4-Dimethylphenol	5	143 2-Picoline	20

Table 6-10 (continued) COMBUSTION GAS SCRUBBER DISCHARGE WATER-BDAT LIST CONSTITUENT DETECTION LIMITS

BDAT CONSTITUENT	DETECTION LIMIT	BDAT CONSTITUENT	DETECTION LIM
SEMIVOLATILES (CONTINUED):	(ppb)	METALS:	(ppb)
144 Pronamide	10	154 Antimony	240
145 Pyrene	2	155 Arsenic	2
146 Resorcinol	NA	156 Barium	6
147 Safrole	NA	157 Beryllium	1
148 1,2,4,5-Tetrachlorobenzene	5	158 Cadmium	3
149 2,3,4,6-Tetrachlorophenol	10	159 Chromium	9
150 1,2,4-Trichlorobenzene	5	159 Chromium, hexavalent	200
151 2,4,5-Trichlorophenol	10	160 Copper	10
152 2,4,6-Trichlorophenol	10	161 Lead	50
153 Tris(2,3-dibromopropyl) phosphate	NA	162 Mercury	0.2
		163 Nickel	20
* 7,12-Dimethylbenz(a)anthracene	5	164 Selenium	25
* alpha,alpha-Dimethylphenethylamine	10	165 Silver	9
* Benzoic acid	50	166 Thallium	2
* Benzyl alcohol	5	167 Vanadium	20
* 4-Chlorophenyl phenyl ether	5	168 Zinc	6
* Dibenzofuran	2		
* Dibenzo(a,h)pyrene	NA	OTHER CONSTITUENTS:	(ppb)
* Isophorone	2		
* 2-Methylnaphthalene	2	169 Total Cyanide	10
* 2-Nitroaniline	10	170 Fluoride	5
* 3-Nitroaniline	10	171 Sulfide	1000
* 2-Nitrophenol	10		
* N-Nitrosodiphenylamine	2	PHYSICAL PARAMETERS:	
		Total Solids (% residue)	0.05

NA The standard is not available; the compound was searched using an NBS library database of 42,000 compounds.

* This constituent is not on the list of constituents in the GENERIC QUALITY ASSURANCE PROJECT PLAN FOR LAND DISPOSAL RESTRICTIONS PROGRAM ("BDAT"), EPA/530-SW-87-011, March 1987. It is a ground-water monitoring constituent as listed in Appendix IX, Page 28838, of the FEDERAL REGISTER, Vol. 51, No. 142.

+ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a semivolatile constituent but was analyzed as a volatile constituent.

++ The compound appears in the GENERIC QUALITY ASSURANCE PROJECT PLAN as a volatile constituent but was analyzed as a semivolatile constituent.

Table 6-11 K024 Scrubber Water Detection Limits

BDAT constituent	Detection limit
Volatile constituents:	(ppm)
1 Acetonitrile	--
2 Acrolein	--
3 Acrylonitrile	0.010
4 Benzene	0.002
5 Bromodichloromethane	0.002
6 Bromomethane	0.002
7 Carbon tetrachloride	0.002
8 Carbon disulfide	0.002
9 Chlorobenzene	0.002
10 2-Chloro-1,3-butadiene	0.002
11 Chlorodibromomethane	0.002
12 Chloroethane	0.002
13 2-Chloroethyl vinyl ether	0.002
14 Chloroform	0.002
15 Chloromethane	0.002
16 3-Chloropropane	0.002
17 1,2-Dibromo-3-chloropropane	0.002
18 1,2-Dibromoethane	0.002
19 Dibromomethane	0.002
20 Trans-1,4-dichloro-2-butane	0.002
21 Dichlorodifluoromethane	0.002
22 1,1-Dichloroethane	0.002
23 1,2-Dichloroethane	0.002
24 1,1-Dichloroethylene	0.002
25 Trans-1,2-dichloroethane	0.002
26 1,2-Dichloropropane	0.005
27 Trans-1,3-dichloropropane	0.005
28 cis-1,3-Dichloropropane	0.005
29 1,4-Dioxane	0.10
30 Ethyl cyanide	--
31 Ethyl methacrylate	0.002
Volatile constituents:	(ppm)
32 Iodomethane	0.002
33 Isobutyl alcohol	--
34 Methyl ethyl ketone	0.010
35 Methyl methacrylate	--
37 Methylacrylonitrile	0.010
38 Methylene chloride	0.10
40 1,1,1,2-Tetrachloroethane	0.002
41 1,1,2,2-Tetrachloroethane	0.002
42 Tetrachloroethene	0.002
43 Toluene	0.002
44 Tribromomethane	0.002
45 1,1,1-Trichloroethane	0.002
46 1,1,2-Trichloroethane	0.002
47 Trichloroethene	0.002
48 Trichloromonofluoromethane	0.002
49 1,2,3-Trichloropropane	--
50 Vinyl chloride	0.002
79 3-Chloropropionitrile	--

Source: USEPA 1987a.

Table 6-11 (continued)

BDAT constituent	Detection limit	BDAT constituent	Detection limit
Semivolatile constituents:	(ppm)	Semivolatile constituents:	(ppm)
38 Methyl methanesulfonate	-	97 Dimethyl phthalate	0.010
39 Pyridine	-	98 Di-n-butyl phthalate	0.010
51 Acenaphthalene	-	99 1,4-Dinitrobenzene	0.010
52 Acenaphthane	-	100 4,6-Dinitro-o-cresol	0.050
53 Acetophenone	-	101 2,4-Dinitrophenol	0.050
54 2-Acetylaminofluorene	1.0	102 2,4-Dinitrotoluene	0.010
55 4-Aminobiphenyl	0.2	103 2,6-Dinitrotoluene	0.010
56 Aniline	0.020	104 Di-n-octyl phthalate	0.010
57 Anthracene	0.010	105 Di-n-propylnitrosamine	-
58 Aramite	-	106 Diphenylamine	-
59 Benz(a)anthracene	0.010	107 1,2-Diphenylhydrazine	0.010
60 Benzenethiol	-	108 Fluoranthene	0.010
61 Benzidine	1.0	109 Fluorene	0.010
62 Benzo(a)pyrene	0.010	110 Hexachlorobenzene	0.010
63 Benzo(b)fluoranthene	0.010	111 Hexachlorobutadiene	0.010
64 Benzo(g,h,i)perylene	-	112 Hexachlorocyclopentadiene	0.010
65 Benzo(k)fluoranthene	0.010	113 Hexachloroethane	0.002
66 p-Benzoquinone	1.0	114 Hexachlorophene	20
67 Bis(2-chloroethoxy)ethane	0.010	115 Hexachloropropene	0.010
68 Bis(2-chloroethyl)ether	0.010	116 Indeno(1,2,3-c,d)pyrene	0.010
69 Bis(2-chloroisopropyl)ether	0.010	117 Isosafrole	0.10
70 Bis(2-ethylexyl)phthalate	0.010	118 Methapyrilene	-
71 4-Bromophenyl phenyl ether	0.010	119 3-Methylcholanthrene	0.10
72 Butyl benzyl phthalate	0.010	120 4,4'-Methylenabis(2-chloroaniline)	0.20
73 2-sec-Butyl-4,6-dinitrophenol	-	121 Naphthalene	0.010
74 p-Chloroaniline	20	122 1,4-Naphthoquinone	0.10
75 Chlorobenzilate	-	123 1-Naphthylamine	0.10
76 p-Chloro-m-cresol	0.010	124 2-Naphthylamine	0.10
77 2-Chloronaphthalene	0.010	125 p-Nitroaniline	0.050
78 2-Chlorophenol	0.010	126 Nitrobenzene	0.010
80 Chrysene	0.010	127 4-Nitrophenol	0.05
81 ortho-Cresol	0.010	128 N-Nitrosodi-n-butylamine	0.10
82 para-Cresol	0.010	129 N-Nitrosodiethylamine	0.10
83 Dibenz(a,h)anthracene	0.010	130 N-Nitrosodimethylamine	0.10
84 Dibenzo(a,e)pyrene	-	131 N-Nitrosomethylethylamine	0.10
85 Dibenzo(a,i)pyrene	-	132 N-Nitrosomorpholine	0.20
86 m-Dichlorobenzene	0.010	133 N-Nitrosopiperidine	0.20
87 o-Dichlorobenzene	0.010	134 N-Nitrosopyrrolidine	0.20
88 p-Dichlorobenzene	0.010	135 5-Nitro-o-toluidine	0.20
89 3,3'-Dichlorobenzidine	0.02	136 Pentachlorobenzene	0.01
90 2,4-Dichlorophenol	0.010	137 Pentachloroethene	0.01
91 2,6-Dichlorophenol	0.010	138 Pentachloronitrobenzene	0.10
92 Diethyl phthalate	0.010	139 Pentachlorophenol	0.05
93 3,3'-Dimethoxybenzidine	10.0	140 Phenacetin	0.10
94 p-Dimethylaminoazobenzene	0.04	141 Phenanthrene	0.010
95 3,3'-Dimethylbenzidine	10.0	142 Phenol	0.010
96 2,4-Dimethylphenol	0.010	143 2-Picoline	0.10

Source: USEPA 1987a.

Table 6-11 (continued)

BDAT constituent		Detection limit
Semivolatiles (continued):		(ppm)
144	Pronamide	0.10
145	Pyrene	0.01
146	Resorcinol	1.0
147	Safrole	0.10
148	1,2,4,5-Tetrachlorobenzene	0.010
149	2,3,4,8-Tetrachlorophenol	0.10
150	1,2,4-Trichlorobenzene	0.01
151	2,4,5-Trichlorophenol	0.05
152	2,4,6-Trichlorophenol	0.01
153	Tris(2,3-dibromopropyl)phosphate	-
	7,12-Dimethylbenz(a)anthracene	-

- No data available.
Source: USEPA 1987a.

Table 6-12 K087 Scrubber Water Detection Limits

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5	6
BDAT Volatile Organics (ppb)						
Acetone	10	10	10	10	10	10
Acetonitrile	100	100	100	100	100	100
Acrolein	100	100	100	100	100	100
Acrylonitrile	100	100	100	100	100	100
Benzene	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5
Bromomethane	10	10	10	10	10	10
n-Butyl alcohol						
Carbon tetrachloride	5	5	5	5	5	5
Carbon disulfide	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5
2-Chloro-1,3-butadiene	100	100	100	100	100	100
Chlorodibromomethane	5	5	5	5	5	5
Chloroethane	10	10	10	10	10	10
2-Chloroethyl vinyl ether	10	10	10	10	10	10
Chloroform	5	5	5	5	5	5
Chloromethane	10	10	10	10	10	10
3-Chloropropene	100	100	100	100	100	100
1,2-Dibromo-3-chloropropane	10	10	10	10	10	10
1,2-Dibromomethane	5	5	5	5	5	5
Dibromomethane	5	5	5	5	5	5
trans-1,4-Dichloro-2-butene	100	100	100	100	100	100
Dichlorodifluoromethane	10	10	10	10	10	10
1,1-Dichloroethane	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5
1,1-Dichloroethylene	5	5	5	5	5	5
trans-1,2-Dichloroethene	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5
trans-1,3-Dichloropropene	5	5	5	5	5	5
cis-1,3-Dichloropropene	5	5	5	5	5	5
1,4-Dioxane	200	200	200	200	200	200
Ethyl benzene	5	5	5	5	5	5
Ethyl cyanide	100	100	100	100	100	100
Ethyl methacrylate	100	100	100	100	100	100
Ethylene oxide						
Iodomethane	50	50	50	50	50	50
Isobutyl alcohol	200	200	200	200	200	200
Methyl ethyl ketone	10	10	10	10	10	10
Methyl isobutyl ketone						
Methyl methacrylate	100	100	100	100	100	100
Methylacrylonitrile	100	100	100	100	100	100
Methylene chloride	5	5	5	5	5	5
Pyridine	400	400	400	400	400	400
1,1,1,2-Tetrachloroethane	5	5	5	5	5	5

Source: USEPA 1988l.

Table 6-12 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5	6
BDAT Volatile Organics (ppb) (continued)						
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5
Toluene	5	5	5	5	5	5
Tribromomethane	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5
Trichloromonofluoromethane	5	5	5	5	5	5
1,2,3-Trichloropropane	5	5	5	5	5	5
Vinyl chloride	10	10	10	10	10	10
Xylenes	5	5	5	5	5	5
BDAT Semivolatile Organics (ppb)						
Acenaphthalene	10	10	10	10	10	10
Acenaphthene	10	10	10	10	10	10
Acetophenone	10	10	10	10	10	10
2-Acetylaminofluorene	10	10	10	10	10	10
4-Aminobiphenyl	50	50	50	50	50	50
Aniline	10	10	10	10	10	10
Anthracene						
Aramite	50	50	50	50	50	50
Benz(a)anthracene	10	10	10	10	10	10
Benzenethiol						
Benzidine	100	100	100	100	100	100
Benzo(a)pyrene	10	10	10	10	10	10
Benzo(b)fluoranthene	50	50	50	50	50	50
Benzo(ghi)perylene	10	10	10	10	10	10
Benzo(k)fluoranthene	10	10	10	10	10	10
p-Benzoquinone	20	20	20	20	20	20
is(2-chloroethoxy)ethane	10	10	10	10	10	10
Bis(2-chloroethyl)ether	10	10	10	10	10	10
Bis(2-chloropropyl)ether						
Bis(2-ethylhexyl)phthalate	10	10	10	10	10	10
4-Bromophenyl phenyl ether	10	10	10	10	10	10
Butyl benzyl phthalate						
2-sec-Butyl-4,6-dinitrophenol						
p-Chloroaniline	10	10	10	10	10	10
Chlorobenzilate	10	10	10	10	10	10
p-Chloro-m-cresol	10	10	10	10	10	10
2-Chloronaphthalene	10	10	10	10	10	10

Source: USEPA 1988l.

Table 6-12 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5	6
BDAT Semivolatile Organics (ppb) (continued)						
2-Chlorophenol	20	20	20	20	20	20
3-Chloropropionitrile	10	10	10	10	10	10
Chrysene	50	50	50	50	50	50
ortho-Cresol	10	10	10	10	10	10
para-Cresol	10	10	10	10	10	10
Dibenz(a,h)anthracene	10	10	10	10	10	10
Dibenzo(a,e)pyrene	50	50	50	50	50	50
Dibenzo(a,i)pyrene	10	10	10	10	10	10
m-Dichlorobenzene	20	20	20	20	20	20
o-Dichlorobenzene	10	10	10	10	10	10
p-Dichlorobenzene	20	20	20	20	20	20
3,3'-Dichlorobenzidine	10	10	10	10	10	10
2,4-Dichlorophenol	10	10	10	10	10	10
2,6-Dichlorophenol	20	20	20	20	20	20
Diethyl phthalate	10	10	10	10	10	10
3,3'-Dimethoxybenzidine						
p-Dimethylaminoazobenzene	20	20	20	20	20	20
3,3'-Dimethylbenzidine	10	10	10	10	10	10
2,4-Dimethylphenol	10	10	10	10	10	10
Dimethyl phthalate						
Di-n-butyl phthalate	10	10	10	10	10	10
1,4-Dinitrobenzene	50	50	50	50	50	50
4,6-Dinitro-o-cresol						
2,4-Dinitrophenol	10	10	10	10	10	10
2,4-Dinitrotoluene	10	10	10	10	10	10
2,6-Dinitrotoluene	10	10	10	10	10	10
Di-n-octyl phthalate	50	50	50	50	50	50
Diphenylamine/ diphenylnitrosamine	10	10	10	10	10	10
1,2-Diphenylhydrazine	20	20	20	20	20	20
Fluoranthene	10	10	10	10	10	10
Fluorene	10	10	10	10	10	10
Hexachlorobenzene	10	10	10	10	10	10
Hexachlorobutadiene	10	10	10	10	10	10
Hexachlorocyclopentadiene	10	10	10	10	10	10
Hexachloroethane	50	50	50	50	50	50
Hexachlorophene						
Hexachloropropene						
Indeno(1,2,3-cd)pyrene	10	10	10	10	10	10

Source: USEPA 1988l.

Table 6-12 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5	6
BDAT Semivolatile Organics (ppb) (continued)						
Isosafrole	50	50	50	50	50	50
Methapyrilene	10	10	10	10	10	10
3-Methylcholanthrene						
4,4'-Methylenebis(2-chloroaniline)	10	10	10	10	10	10
Methyl methanesulfonate						
Naphthalene	10	10	10	10	10	10
1,4-Naphthoquinone	50	50	50	50	50	50
1-Naphthylamine						
2-Naphthylamine	50	50	50	50	50	50
p-Nitroaniline						
Nitrobenzene	10	10	10	10	10	10
4-Nitrophenol						
N-Nitrosodi-n-butylamine	20	20	20	20	20	20
N-Nitrosodiethylamine	10	10	10	10	10	10
N-Nitrosodimethylamine	20	20	20	20	20	20
N-Nitrosomethylethylamine	10	10	10	10	10	10
N-Nitrosomorpholine						
N-Nitrosopiperidine	10	10	10	10	10	10
N-Nitrosopyrrolidine						
5-Nitro-o-toluidine	10	10	10	10	10	10
Pentachlorobenzene	10	10	10	10	10	10
Pentachloroethane	10	10	10	10	10	10
Pentachloronitrobenzene						
Pentachlorophenol	20	20	20	20	20	20
Phenacetin	10	10	10	10	10	10
Phenanthrene	10	10	10	10	10	10
Phenol	10	10	10	10	10	10
2-Picoline	50	50	50	50	50	50
Pronamide	20	20	20	20	20	20
Pyrene	20	20	20	20	20	20
Resorcinol	20	20	20	20	20	20
Safrole	10	10	10	10	10	10
1,2,4,5-Tetrachlorobenzene						
2,3,4,6-Tetrachlorophenol						
1,2,4-Trichlorobenzene						
2,4,5-Trichlorophenol	50	50	50	50	50	50
2,4,6-Trichlorophenol	10	10	10	10	10	10
Tris(2,3-dibromopropyl)phosphate						

Source: USEPA 1988l.

Table 6-12 (continued)

Constituent/parameter (units)	Detection limit Sample Set # 1	2	3	4	5	6
BDAT Metals (ppb)						
Antimony	32	33	20	20	20	32
Arsenic	10	10	10	10	10	10
Barium	1.0	1.0	200	200	200	1.0
Beryllium	1.0	1.0	5.0	5.0	5.0	1.0
Cadmium	4.0	4.0	10	10	10	4.0
Chromium	7.0	7.0	20	20	20	7.0
Copper	6.0	6.0	25	25	25	6.0
Lead	5.0	5.0	10	10	10	5.5
Mercury	0.20	0.20	0.30	0.30	0.30	0.20
Nickel	11	11	40.	40.	40.	11
Selenium	5.0	5.0	5.0	5.0	5.0	5.0
Silver	6.0	7.0	50	50	50	6.0
Thallium	10	10	10	10	10	10
Vanadium	6.0	6.0	50	50	50	6.0
Zinc	2.0	2.0	50	50	50	2.0
BDAT Inorganics Other Than Metals (ppm)						
Cyanide	0.01	0.01	0.01	0.01	0.01	0.01
Fluoride	0.20	0.20	0.01	-	-	0.20
Sulfide	1.0	1.0	1.0	1.0	1.0	1.0
BDAT PCBs (ppb)						
Aroclor 1016	-	-	-	-	-	0.5
Aroclor 1221	-	-	-	-	-	0.5
Aroclor 1232	-	-	-	-	-	0.5
Aroclor 1242	-	-	-	-	-	0.5
Aroclor 1248	-	-	-	-	-	0.5
Aroclor 1254	-	-	-	-	-	1.0
Aroclor 1260	-	-	-	-	-	1.0
BDAT Dioxins/Furans (ppt)						
Hexachlorodibenzo-p-dioxins	-	-	-	-	-	0.39
Hexachlorodibenzofuran	-	-	-	-	-	0.32
Pentachlorodibenzo-p-dioxins	-	-	-	-	-	1.45
Pentachlorodibenzofuran	-	-	-	-	-	0.75
Tetrachlorodibenzo-p-dioxins	-	-	-	-	-	0.32
Tetrachlorodibenzofuran	-	-	-	-	-	0.32
2,3,7,8-Tetrachlorodibenzo-p-dioxin	-	-	-	-	-	0.32

Source: USEPA 1988l.

Table A-1 EPA-Collected Data for Nonwastewater Forms of F and K Wastes Containing Polynuclear Aromatic Constituents Treated by Incineration

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) F024					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	0.666	0.666	0.702	0.666	0.666	0.666
U022	Benzo(a)pyrene	<3.51-0.6	0.333	0.333	0.351	0.333	0.333	0.333
U050	Chrysene	0.41-1.1	0.333	0.333	0.351	0.333	0.333	0.333
U063	Dibenzo(a,h)anthracene	NP	0.333	0.333	0.351	0.333	0.333	0.333
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	0.333	0.333	0.351	0.333	0.333	0.333
U120	Fluoranthene	NP	0.333	0.333	0.351	0.333	0.333	0.333
U137	Ideno(1,2,3,cd)pyrene	<3.51-0.41	0.333	0.333	0.351	0.333	0.333	0.333
U157	3-methylcholanthrene	NP	0.666	0.666	0.702	0.666	0.666	0.666
U018	Benz(a)anthracene	<3.51-0.89	0.333	0.333	0.351	0.333	0.333	0.333
U165	Naphthalene	NP	0.333	0.333	0.351	0.333	0.333	0.333

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: USEPA 1989a.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K001 (PCP) Samp.1	Samp.2	Samp.3
U005	2-Acetylaminofluorene	NP	50	50	50
U022	Benzo(a)pyrene	620 - 940	0.5	0.5	0.5
U050	Chrysene	3,600	0.5	0.5	0.5
U063	Dibenzo(a,h)anthracene	NP	0.5	0.5	0.5
U064	1,2,7,8-dibenzopyrene	NP	0.5	0.5	0.5
U094	7,12-dimethylbenz(a) anthracene	NP	ND	ND	ND
U120	Fluoranthene	13,000 - 21,000	0.5	0.5	0.5
U137	Ideno(1,2,3,cd)pyrene	NP	0.5	0.5	0.5
U157	3-methylcholanthrene	NP	5.0	5.0	5.0
U018	Benz(a)anthracene	2,500 - 3,400Z	0.5	0.5	0.5
U165	Naphthalene	26,000 - 43,000	0.5	0.5	0.5

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: USEPA 1987b, USEPA 1988f.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K001 (creosote)				
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5
U005	2-Acetylaminofluorene	NP	0.43	0.43	0.43	0.43	0.43
U022	Benzo(a)pyrene	NP	0.17	0.17	0.17	0.17	0.17
U050	Chrysene	4,100 - 4,800	0.17	0.17	0.17	0.17	0.17
U063	Dibenzo(a,h)anthracene	NP	0.17	0.17	0.17	0.17	0.17
U064	1,2,7,8-dibenzopyrene	NP	0.17	0.17	0.17	0.17	0.17
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	0.15	0.15	0.15	0.15	0.15
U137	Ideno(1,2,3,cd)pyrene	NP	0.25	0.25	0.25	0.25	0.25
U157	3-methylcholanthrene	NP	0.23	0.23	0.23	0.23	0.23
U018	Benz(a)anthracene	NP	0.52	0.52	0.52	0.52	0.52
U165	Naphthalene	29,000 - 43,000	0.11	0.11	0.11	0.11	0.11

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: Radian Corp. 1987.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K011/K013/K014 Samp.1	Detection limits (ppm) K011/K013/K014 Samp.2
U005	2-Acetylaminofluorene	NP	1,000	1,000
U022	Benzo(a)pyrene	NP	10	10
U050	Chrysene	NP	10	10
U063	Dibenzo(a,h)anthracene	NP	10	10
U064	1,2,7,8-dibenzopyrene	NP	10	10
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND
U120	Fluoranthene	NP	10	10
U137	Ideno(1,2,3,cd)pyrene	NP	10	10
U157	3-methylcholanthrene	NP	100	100
U018	Benz(a)anthracene	NP	10	10
U165	Naphthalene	NP	10	10

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988p.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K015 Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	NO ASH GENERATED					
U022	Benzo(a)pyrene	NP						
U050	Chrysene	NP						
U063	Dibenzo(a,h)anthracene	NP						
U064	1,2,7,8-dibenzopyrene	NP						
U094	7,12-dimethylbenz(a)-anthracene	NP						
U120	Fluoranthene	NP						
U137	Ideno(1,2,3,cd)pyrene	NP						
U157	3-methylcholanthrene	NP						
U018	Benz(a)anthracene	NP						
U165	Naphthalene	NP						

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1987c, USEPA 1988g.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K019 Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	ND	ND	ND	ND	ND	ND
U022	Benzo(a)pyrene	NP	2.0	2.0	2.0	2.0	2.0	2.0
U050	Chrysene	ND	2.0	2.0	2.0	2.0	2.0	2.0
U063	Dibenzo(a,h)anthracene	NP	2.0	2.0	2.0	2.0	2.0	2.0
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	5.0	5.0	5.0	5.0	5.0	5.0
U120	Fluoranthene	NP	2.0	2.0	2.0	2.0	2.0	2.0
U137	Ideno(1,2,3,cd)pyrene	NP	5.0	5.0	5.0	5.0	5.0	5.0
U157	3-methylcholanthrene	NP	ND	ND	ND	ND	ND	ND
U018	Benz(a)anthracene	NP	2.0	2.0	2.0	2.0	2.0	2.0
U165	Naphthalene	314 - 470	2.0	2.0	2.0	2.0	2.0	2.0

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: USEPA 1988h, USEPA 1988m.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K022 (Plant 1)					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	CBI	4.20	8.40	4.16	4.16	4.116	4.16
U022	Benzo(a)pyrene	CBI	3.50	7.0	3.46	3.46	3.43	3.46
U050	Chrysene	CBI	2.40	4.79	2.37	2.37	2.35	2.37
U063	Dibenzo(a,h)anthracene	CBI	4.10	8.20	4.06	4.06	4.02	4.06
U064	1,2,7,8-dibenzopyrene	CBI	4.50	9.0	4.45	4.45	4.41	4.45
U094	7,12-dimethylbenz(a)-anthracene	CBI	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	CBI	3.0	6.0	2.97	2.97	2.94	2.97
U137	Ideno(1,2,3,cd)pyrene	CBI	2.95	5.90	2.92	2.92	2.89	2.92
U157	3-methylcholanthrene	CBI	6.50	13.0	6.43	6.43	6.37	6.43
U018	Benz(a)anthracene	CBI	0.80	1.60	0.79	0.79	0.784	0.79
U165	Naphthalene	CBI	0.55	1.10	0.54	0.54	0.539	0.54

ND - No data available.
CBI - Confidential Business Information.

Source: USEPA 1988i.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K022 (Plant 2)					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	CBI	1.396	1.396	1.396	1.396	1.396	1.396
U022	Benzo(a)pyrene	CBI	1.155	1.155	1.155	1.155	1.155	1.155
U050	Chrysene	CBI	0.792	0.792	0.792	0.792	0.792	0.792
U063	Dibenzo(a,h)anthracene	CBI	1.353	1.353	1.353	1.353	1.353	1.353
U064	1,2,7,8-dibenzopyrene	CBI	1.485	1.485	1.485	1.485	1.485	1.485
U094	7,12-dimethylbenz(a)-anthracene	CBI	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	CBI	0.990	0.990	0.990	0.990	0.990	0.990
U137	Ideno(1,2,3,cd)pyrene	CBI	0.974	0.974	0.974	0.974	0.974	0.974
U157	3-methylcholanthrene	CBI	2.145	2.145	2.145	2.145	2.145	2.145
U018	Benz(a)anthracene	CBI	0.264	0.264	0.264	0.264	0.264	0.264
U165	Naphthalene	CBI	0.182	0.182	0.182	0.182	0.182	0.182

ND - No data available.

CBI - Confidential Business Information

Source: USEPA 1988i.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (mg/kg)	Detection limits (ppm) K024 Samp.1	Samp.2	Samp.3
U005	2-Acetylaminofluorene	NP	50.0	50.0	50.0
U022	Benzo(a)pyrene	NP	0.5	0.5	0.5
U050	Chrysene	NP	0.5	0.5	0.5
U063	Dibenzo(a,h)anthracene	NP	0.5	0.5	0.5
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND
U120	Fluoranthene	NP	0.5	0.5	0.5
U137	Ideno(1,2,3,cd)pyrene	NP	0.5	0.5	0.5
U157	3-methylcholanthrene	NP	5.0	5.0	5.0
U018	Benz(a)anthracene	NP	0.5	0.5	0.5
U165	Naphthalene	NP	0.5	0.5	0.5

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limits.

Source: USEPA 1987a, USEPA 1988a.

Taboe A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (mg/kg)	Detection limits (ppm) K037 Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6	Samp.7
U005	2-Acetylaminofluorene	NP	40	40	40	40	40	40	400
U022	Benzo(a)pyrene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U050	Chrysene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U063	Dibenzo(a,h)anthracene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U064	1,2,7,8-dibenzopyrene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U137	Ideno(1,2,3,cd)pyrene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U157	3-methylcholanthrene	NP	4.0	4.0	4.0	4.0	4.0	4.0	4.0
U018	Benz(a)anthracene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4
U165	Naphthalene	NP	0.4	0.4	0.4	0.4	0.4	0.4	0.4

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limits.

Sources: USEPA 1988b, 1988t.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K048/K051					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	ND	ND	ND	ND	ND	ND
U022	Benzo(a)pyrene	NP	0.2	0.2	0.2	0.2	0.2	0.2
U050	Chrysene	<20 - 51	0.2	0.2	0.2	0.2	0.2	0.2
U063	Dibenzo(a,h)anthracene	NP	0.2	0.2	0.2	0.2	0.2	0.2
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	0.2	0.2	0.2	0.2	0.2	0.2
U137	Ideno(1,2,3,cd)pyrene	NP	0.5	0.5	0.5	0.5	0.5	0.5
U157	3-methylcholanthrene	NP	ND	ND	ND	ND	ND	ND
U018	Benz(a)anthracene	<20 - 29	0.2	0.2	0.2	0.2	0.2	0.2
U165	Naphthalene	93 - 170	0.2	0.2	0.2	0.2	0.2	0.2

ND - No data available.

NP - Not present in concentrations equal to or greater than the detection limits.

Sources: USEPA 1987d, USEPA 1988j.

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Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K086					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	CBI						
U022	Benzo(a)pyrene	CBI						
U050	Chrysene	CBI						
U063	Dibenzo(a,h)anthracene	CBI						
U064	1,2,7,8-dibenzopyrene	CBI	NO ASH DATA					
U094	7,12-dimethylbenz(a)-anthracene	CBI						
U120	Fluoranthene	CBI						
U137	Ideno(1,2,3,cd)pyrene	CBI						
U157	3-methylcholanthrene	CBI						
U018	Benz(a)anthracene	CBI						
U165	Naphthalene	CBI						

CBI - Confidential Business Information.

Source: USEPA 1988c.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm)				
			K087				
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5
U005	2-Acetylaminofluorene	NP	2.0	2.0	2.0	2.0	2.0
U022	Benzo(a)pyrene	3,800 - 5,400	1.0	1.0	1.0	1.0	1.0
U050	Chrysene	4,700 - 6,500	1.0	1.0	1.0	1.0	1.0
U063	Dibenzo(a,h)anthracene	NP	1.0	1.0	1.0	1.0	1.0
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND
U120	Fluoranthene	<982 - 12,000	1.0	1.0	1.0	1.0	1.0
U137	Ideno(1,2,3,cd)pyrene	2,100 - 3,100	1.0	1.0	1.0	1.0	1.0
U157	3-methylcholanthrene	NP	2.0	2.0	2.0	2.0	2.0
U018	Benz(a)anthracene	5,400 - 7,500	1.0	1.0	1.0	1.0	1.0
U165	Naphthalene	63,000 - 81,000	1.0	1.0	1.0	1.0	1.0

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limits.

Sources: USEPA 1988l, USEPA 1988k.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K101 Samp.1	Samp.2	Samp.3	Samp.4
U005	2-Acetylaminofluorene	NP	0.840	0.840	0.840	0.840
U022	Benzo(a)pyrene	NP	0.420	0.420	0.420	0.420
U050	Chrysene	NP	0.420	0.420	0.420	0.420
U063	Dibenzo(a,h)anthracene	NP	0.420	0.420	0.420	0.420
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND
U094	7,12-dimethylbenz(a) anthracene	NP	ND	ND	ND	ND
U120	Fluoranthene	NP	0.420	0.420	0.420	0.420
U137	Ideno(1,2,3,cd)pyrene	NP	0.420	0.420	0.420	0.420
U157	3-methylcholanthrene	NP	0.840	0.840	0.840	0.840
U018	Benz(a)anthracene	NP	0.420	0.420	0.420	0.420
U165	Naphthalene	NP	0.420	0.420	0.420	0.420

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limits.

Sources: USEPA 1988d, USEPA 1988n.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K102 Samp.1	Samp.2	Samp.3	Samp.4	Samp.5
U005	2-Acetylaminofluorene	NP	2.0	2.0	2.0	2.0	2.0
U022	Benzo(a)pyrene	NP	1.0	1.0	1.0	1.0	1.0
U050	Chrysene	NP	1.0	1.0	1.0	1.0	1.0
U063	Dibenzo(a,h)anthracene	NP	1.0	1.0	1.0	1.0	1.0
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	1.0	1.0	1.0	1.0	1.0
U137	Ideno(1,2,3,cd)pyrene	NP	1.0	1.0	1.0	1.0	1.0
U157	3-methylcholanthrene	NP	2.0	2.0	2.0	2.0	2.0
U018	Benz(a)anthracene	NP	1.0	1.0	1.0	1.0	1.0
U165	Naphthalene	NP	1.0	1.0	1.0	1.0	1.0

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limits.

Sources: USEPA 1988e, USEPA 1988o.

Table A-1 (continued)

Waste code	Constituent	Concentration of constituent in F and K waste (ppm)	Detection limits (ppm) John Zink 1989 Pesticides Test Burn					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene		None of these constituents were burned					
U022	Benzo(a)pyrene							
U050	Chrysene							
U063	Dibenzo(a,h)anthracene							
U064	1,2,7,8-dibenzopyrene							
U094	7,12-dimethylbenz(a)-anthracene							
U120	Fluoranthene							
U137	Ideno(1,2,3,cd)pyrene							
U157	3-methylcholanthrene							
U018	Benz(a)anthracene							
U165	Naphthalene							

Source: USEPA 1989b.

Table A-2 EPA-Collected Data for Wastewater Forms of F and K Wastes Containing Polynuclear Aromatic Constituents Treated by Incineration

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) F024					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	<.351-0.6	0.0232	0.0242	0.0216	0.0208	0.0212	0.0214
U022	Benzo(a)pyrene	<.351-0.6	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U050	Chrysene	NP	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U063	Dibenzo(a,h)anthracene	0.41-1.1	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U120	Fluoranthene	NP	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U137	Ideno(1,2,3,cd)pyrene	<.351-0.41	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U157	3-methylcholanthrene	NP	0.0232	0.0242	0.0216	0.0208	0.0212	0.0214
U018	Benz(a)anthracene	<.351-0.89	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107
U165	Naphthalene	NP	0.0116	0.0121	0.0108	0.0104	0.0106	0.0107

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: USEPA 1989a.

TAble A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K001 (PCP) Samp.1	Samp.2	Samp.3
U005	2-Acetylaminofluorene	NP	5.0	5.0	5.0
U022	Benzo(a)pyrene	620 - 940	0.050	0.050	0.050
U050	Chrysene	3,600	0.050	0.050	0.050
U063	Dibenzo(a,h)anthracene	NP	0.050	0.050	0.050
U064	1,2,7,8-dibenzopyrene	NP	0.050	0.050	0.050
U094	7,12-dimethylbenz(a) anthracene	NP	ND	ND	ND
U120	Fluoranthene	13,000 - 21,000	0.050	0.050	0.050
U137	Ideno(1,2,3,cd)pyrene	NP	0.050	0.050	0.050
U157	3-methylcholanthrene	NP	0.050	0.050	0.050
U018	Benz(a)anthracene	2,500 - 3,400	ND	ND	ND
U165	Naphthalene	26,000 - 43,000	0.050	0.050	0.050

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1987b, USEPA 1988f.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K001 (Creosote) Samp.1	Samp.2	Samp.3	Samp.4	Samp.5
U005	2-Acetylaminofluorene	NP	0.006	0.006	0.006	0.006	0.006
U022	Benzo(a)pyrene	NP	0.003	0.003	0.003	0.003	0.003
U050	Chrysene	4,100 - 4,800	0.003	0.003	0.003	0.003	0.003
U063	Dibenzo(a,h)anthracene	NP	0.003	0.003	0.003	0.003	0.003
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	0.002	0.002	0.002	0.002	0.002
U137	Ideno(1,2,3,cd)pyrene	NP	0.004	0.004	0.004	0.004	0.004
U157	3-methylcholanthrene	NP	0.004	0.004	0.004	0.004	0.004
U018	Benz(a)anthracene	NP	0.008	0.008	0.008	0.008	0.008
U165	Naphthalene	29,000 - 43,000	0.002	0.002	0.002	0.002	0.002

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: Radian Corp. 1987.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K011/K013/K014 Samp. 1	Samp. 2
U005	2-Acetylaminofluorene	NP	1.0	1.0
U022	Benzo(a)pyrene	NP	0.010	0.010
U050	Chrysene	NP	0.010	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	0.010	0.010
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND
U120	Fluoranthene	NP	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	NP	0.010	0.010
U157	3-methylcholanthrene	NP	0.100	0.100
U018	Benz(a)anthracene	NP	0.010	0.010
U165	Naphthalene	NP	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Source: USEPA 1988o.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K015 Samp.1	Samp.2	Samp.3	Samp.4
U005	2-Acetylaminofluorene	NP	5.0	5.0	5.0	5.0
U022	Benzo(a)pyrene	NP	0.050	0.050	0.050	0.050
U050	Chrysene	NP	0.050	0.050	0.050	0.050
U063	Dibenzo(a,h)anthracene	NP	0.050	0.050	0.050	0.050
U064	1,2,7,8-dibenzopyrene	NP	0.050	0.050	0.050	0.050
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND
U120	Fluoranthene	NP	0.050	0.050	0.050	0.050
U137	Ideno(1,2,3,cd)pyrene	NP	0.050	0.050	0.050	0.050
U157	3-methylcholanthrene	NP	0.500	0.500	0.500	0.500
U018	Benz(a)anthracene	NP	0.050	0.050	0.050	0.050
U165	Naphthalene	NP	0.050	0.050	0.050	0.050

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1987c, USEPA 1988g.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm)					
			K019					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	ND	ND	ND	ND	ND	ND
U022	Benzo(a)pyrene	NP	0.002	0.002	0.002	0.002	0.002	0.002
U050	Chrysene	ND	0.002	0.002	0.002	0.002	0.002	0.002
U063	Dibenzo(a,h)anthracene	NP	0.002	0.002	0.002	0.002	0.002	0.002
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	0.005	0.005	0.005	0.005	0.005	0.005
U120	Fluoranthene	NP	0.002	0.002	0.002	0.002	0.002	0.002
U137	Ideno(1,2,3,cd)pyrene	NP	0.005	0.005	0.005	0.005	0.005	0.005
U157	3-methylcholanthrene	NP	ND	ND	ND	ND	ND	ND
U018	Benz(a)anthracene	NP	0.002	0.002	0.002	0.002	0.002	0.002
U165	Naphthalene	314-470	0.002	0.002	0.002	0.002	0.002	0.002

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988h, USEPA 1988m.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm)					
			K022					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	CBI						
U022	Benzo(a)pyrene	CBI						
U050	Chrysene	CBI						
U063	Dibenzo(a,h)anthracene	CBI						
U064	1,2,7,8-dibenzopyrene	CBI			NO WASTEWATER DATA			
U094	7,12-dimethylbenz(a)-anthracene	CBI						
U120	Fluoranthene	CBI						
U137	Ideno(1,2,3,cd)pyrene	CBI						
U157	3-methylcholanthrene	CBI						
U018	Benz(a)anthracene	CBI						
U165	Naphthalene	CBI						

CBI - Confidential Business Information.

Source: USEPA 1988i.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (mg/kg)	Detection limits (ppm) K024 Samp.1	Samp.2	Samp.3
U005	2-Acetylaminofluorene	NP	5.0	5.0	5.0
U022	Benzo(a)pyrene	NP	0.050	0.050	0.050
U050	Chrysene	NP	0.050	0.050	0.050
U063	Dibenzo(a,h)anthracene	NP	0.050	0.050	0.050
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND
U120	Fluoranthene	NP	0.050	0.050	0.050
U137	Ideno(1,2,3,cd)pyrene	NP	0.050	0.050	0.050
U157	3-methylcholanthrene	NP	0.500	0.500	0.500
U018	Benz(a)anthracene	NP	0.050	0.050	0.050
U165	Naphthalene	NP	0.050	0.050	0.050

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1987a, USEPA 1988a.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm)							
			K037							
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6	Samp.7	Samp.8
U005	2-Acetylaminofluorene	NP	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
U022	Benzo(a)pyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U050	Chrysene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND	ND	ND	
U120	Fluoranthene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	NP	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
U018	Benz(a)anthracene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
U165	Naphthalene	NP	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988b, 1988t.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K048/K051					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U022	Benzo(a)pyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U050	Chrysene	<20 - 51	0.010	0.010	0.010	0.010	0.010	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	0.050	0.050	0.050	0.050	0.050	0.050
U094	7,12-dimethylbenz(a)-anthracene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U120	Fluoranthene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U018	Benz(a)anthracene	<20 - 29	0.010	0.010	0.010	0.010	0.010	0.010
U165	Naphthalene	93 - 170	0.010	0.010	0.010	0.010	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1987d, USEPA 1988j.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K086 Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	CBI	1.0	1.0	1.0	1.0	1.0	1.0
U022	Benzo(a)pyrene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U050	Chrysene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U063	Dibenzo(a,h)anthracene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U094	7,12-dimethylbenz(a)-anthracene	CBI	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	CBI	0.100	0.100	0.100	0.100	0.100	0.100
U018	Benz(a)anthracene	CBI	0.010	0.010	0.010	0.010	0.010	0.010
U165	Naphthalene	CBI	0.010	0.010	0.010	0.010	0.010	0.010

ND - No data available.
CBI - Confidential Business Information.

Sources: USEPA 1986b, USEPA 1987e, USEPA 1988c.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm)					
			K087					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U022	Benzo(a)pyrene	3,800 - 5,400	0.010	0.010	0.010	0.010	0.010	0.010
U050	Chrysene	4,700 - 6,500	0.050	0.050	0.050	0.050	0.050	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	0.010	0.010	0.010	0.010	0.010	0.010
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND	ND
U120	Fluoranthene	<982 - 12,000	0.010	0.010	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	2,100 - 3,100	0.010	0.010	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	NP	ND	ND	ND	ND	ND	ND
U018	Benz(a)anthracene	5,400 - 7,500	0.010	0.010	0.010	0.010	0.010	0.010
U165	Naphthalene	63,000 - 81,000	0.010	0.010	0.010	0.010	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988l, USEPA 1988k.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K101			
			Samp.1	Samp.2	Samp.3	Samp.4
U005	2-Acetylaminofluorene	NP	0.020	0.020	0.020	0.020
U022	Benzo(a)pyrene	NP	0.010	0.010	0.010	0.010
U050	Chrysene	NP	0.010	0.010	0.010	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND
U094	7,12-dimethylbenz(a) anthracene	NP	ND	ND	ND	ND
U120	Fluoranthene	NP	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	NP	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	NP	0.020	0.020	0.020	0.020
U018	Benz(a)anthracene	NP	0.010	0.010	0.010	0.010
U165	Naphthalene	NP	0.010	0.010	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988d, USEPA 1988m.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) K102				
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5
U005	2-Acetylaminofluorene	NP	0.020	0.020	0.020	0.020	0.020
U022	Benzo(a)pyrene	NP	0.010	0.010	0.010	0.010	0.010
U050	Chrysene	NP	0.010	0.010	0.010	0.010	0.010
U063	Dibenzo(a,h)anthracene	NP	0.010	0.010	0.010	0.010	0.010
U064	1,2,7,8-dibenzopyrene	NP	ND	ND	ND	ND	ND
U094	7,12-dimethylbenz(a)-anthracene	NP	ND	ND	ND	ND	ND
U120	Fluoranthene	NP	0.010	0.010	0.010	0.010	0.010
U137	Ideno(1,2,3,cd)pyrene	NP	0.010	0.010	0.010	0.010	0.010
U157	3-methylcholanthrene	NP	0.020	0.020	0.020	0.020	0.020
U018	Benz(a)anthracene	NP	0.010	0.010	0.010	0.010	0.010
U165	Naphthalene	NP	0.010	0.010	0.010	0.010	0.010

ND - No data available.

NP - Either not present or not present in concentrations equal to or greater than the detection limit.

Sources: USEPA 1988e, USEPA 1988n.

Table A-2 (continued)

Waste code	Constituent	Concentration of constituent in untreated F and K waste (ppm)	Detection limits (ppm) June 1989 John Zink Test Burn					
			Samp.1	Samp.2	Samp.3	Samp.4	Samp.5	Samp.6
U005	2-Acetylaminofluorene							
U022	Benzo(a)pyrene							
U050	Chrysene							
U063	Dibenzo(a,h)anthracene							
U064	1,2,7,8-dibenzopyrene		NONE OF THESE CONSTITUENTS WERE BURNED					
U094	7,12-dimethylbenz(a)-anthracene							
U120	Fluoranthene							
U137	Ideno(1,2,3,cd)pyrene							
U157	3-methylcholanthrene							
U018	Benz(a)anthracene							
U165	Naphthalene							

Source: USEPA 1989.

Appendix B

Matrix Spike Recoveries* for K001 (Creosote and PCP), K087, and K101 Kiln Ash Residue and Combustion Gas Scrubber Discharge Water and Matrix Spike Recoveries for F006 and Metals for the TCLP Extract for K061 for Horsehead Research Development Co.

*All recovery values greater than 100 percent are considered as just 100 percent for the purpose of calculating accuracy-correction factors.

Table B-1 K001 Creosote Ash Sample Semivolatile Organics Matrix Spike Recoveries (%)

Compound	Initial conc. (μg/g)	Amount added (μg/g)	% Recovery #1	% Recovery #2	RPD
Acid-Extractables					
Phenol	<4	67	72	65	9.7
2-Chlorophenol	<4	67	59	53	10
4-Chloro-3-methylphenol	<4	67	35	68	48
4-Nitrophenol	<20	67	1.2[a]	2.6[a]	54
Pentachlorophenol	<20	67	0[a]	0[a]	NC
Base/Neutral Extractables					
1,4-Dichlorobenzene	<4	33	48	46	4.2
N-nitroso-di-n-propylamine	<4	33	67	62	7.5
1,2,4-Trichlorobenzene	<4	33	30	30	0
Acenaphthene	<4	33	0[a]	3.4[a]	100
2,4-Dinitrotoluene	<4	33	0[a]	0[a]	NC
Pyrene	<4	33	0[a]	0[a]	NC
Percent average of recoveries			48.3	46	

NC - Not calculated.

[a] Recovery values below 20 percent were not considered in determining the average percent recovery.

Source: USEPA 1987b.

Table B-2 K001 Creosote Water Sample Semivolatile Organic Matrix Spike Recoveries (%)

Compound	Initial conc. (μg/l)	Amount added (μg/l)	% Recovery #1	% Recovery #2	RPD
Acid Extractables					
Phenol	<10	100	65	61	6
2-Chlorophenol	<10	100	61	65	6
4-Chloro-3-methylphenol	<10	100	80	73	9
4-Nitrophenol	<50	100	0[a]	0[a]	NC
Pentachlorophenol	<50	100	80	85	6
Base/Neutral Extractables					
1,4-Dichlorobenzene	<10	50	61	51	16
N-nitroso-di-n-propylamine	<100	50	70	56	20
1,2,4-Trichlorobenzene	<10	50	72	54	25
Acenaphthene	<10	50	81	66	19
2,4-Dinitrotoluene	<10	50	21	17[a]	19
Pyrene	<10	50	62	60	3
Percent average of recoveries			61.2	57.4	

NC - Not calculated.

[a] Recovery values below 20 percent were not considered in determining the average percent recovery.

Source: USEPA 1987b.

Table B-3 K001 Creosote Ash Sample ZK01C-3-B2
VOA Matrix Spike Recoveries (%)

	Spike Level (μg/L)	S710125 ZK01C-3-B2 #1	#2	RPD
1,1-Dichloroethene	25	86	95	9.9
Toluene	25	99	110 [a]	10
Chlorobenzene	25	102 [a]	112 [a]	9.3
Benzene	25	78	88	12
Trichlorethylene	25	67	77	14
Average percent recovery		86	92	

Table B-4 K001 Creosote Water Sample ZK01C-3-B2
VOA Matrix Spike Recoveries (%)

	Spike Level (μg/L)	S710125 ZK01C-3-B2 #1	#2	RPD
1,1-Dichloroethene	25	100 [a]	97	3.0
Toluene	25	103 [a]	99	4.0
Chlorobenzene	25	95	90	5.4
Benzene	25	90	85	5.7
Trichlorethylene	25	69	64	7.5
Average percent recovery		90.8	87	

[a] Recovery values greater than 100 percent are considered as just 100 percent in calculating the average percent recovery.

Source: USEPA 1987b.

Table B-5 K001-PCP Ash Duplicate Matrix Spike Data
Volatile Organic Analysis

Compound	Original amount present, µg/liter	Amount spiked, µg/liter	Amount recovered, µg/liter		% Recovery	
			No. 1	No. 2	No. 1	No. 2
Toluene	3	25	30	30	108 [b]	108 [b]
Chlorobenzene	<2	25	31	30	124 [b]	120 [b]
Benzene	<2	25	22	22	88	88
Trichloroethene	<2	25	22	21	88	84
Average percent recovery					94	93

Table B-6 K001-PCP Scrubber Water Duplicate Matrix Spike Data
Volatile Organic Analysis

Compound	Original amount present, µg/liter	Amount spiked, µg/liter	Amount recovered, µg/liter		% Recovery	
			No. 1	No. 2	No. 1	No. 2
1,1-Dichloroethylene	<2	25	23	28	92	112 [b]
Toluene	<2	25	30	30	120 [b]	120 [b]
Chlorobenzene	<2	25	30	26	120 [b]	104 [b]
Benzene	<2	25	23	30	92	120 [b]
Trichloroethene	<2	25	21	21	84	84
Average percent recovery					93.6	96.8

Source: USEPA 1987b.

Table B-7 K001-PCP Scrubber Water Duplicate Matrix Spike Data, Semivolatile Organic Analysis

Compound	Initial Concentration µg/g	Amount added, µg/g	Amount recovered µg/g		% Recovery	
			No. 1	No. 2	No. 1	No. 2
Acid Extractables						
Phenol	<2	200	60	45	30	22
2-Chlorophenol	<2	200	56	40	28	20
4-Chloro-3-methylphenol	<5	200	58	44	29	22
4-Nitrophenol	<10	200	3	1.5	1.5	0.8
Pentachlorophenol	<50	200	6	3.4	3	1.7
Base/Neutral Extractables						
1,4-Dichlorobenzene	<2	100	85	87	85	87
N-Nitrosodinipropylamine	<5	100	70	66	70	66
1,2,4-Trichlorobenzene	<5	100	110	120	110 [a]	120 [a]
Acenaphthene	<2	100	110	110	110 [a]	110 [a]
2,4-Dinitrotoluene	<50	100	79	84	79	84
Pyrene	<2	100	110	110	110 [a]	110 [a]
Average percent recovery					89.5	89.5

[a] Recovery values greater than 100 percent are considered as just 100 percent in calculating the average percent recovery.

Source: USEPA 1987b.

Table B-8 K001-PCP Ash Duplicate Matrix Spike Data, Volatile Organic Analyses

Compound	Initial concentration, µg/liter	Amount added, µg/liter	Amount recovered, mg/l liter		% Recovery	
			No. 1	No. 2	No. 1	No. 2
Acid Extractables						
Phenol	2	200	170	160	85	80
2-Chlorophenol	<2	200	200	210	100	105
4-Chloro-3-methylphenol	<5	200	180	190	90	95
4-Nitrophenol	<10	200	200	180	100	90
Pentachlorophenol	<50	200	190	210	95	105
Base/Neutral Extractables						
1,4-Dichlorobenzene	<2	100	94	94	94	94
N-Nitrosodinipropylamine	<5	100	81	82	81	82
1,2,4-Trichlorobenzene	<5	100	95	100	95	100
Acenaphthene	<5	100	120	120[a]	120[a]	120
2,4-Dinitrotoluene	<50	100	120	120[a]	120[a]	120
Pyrene	<2	100	96	100[a]	96	100
Average percent recovery					94.3	96

[a] Recovery values greater than 100 percent are considered as just 100 percent for calculating the average percent recovery.

Source: USEPA 1987b.

Table B-9. Matrix Spike Recoveries for Kiln Ash Residue (K019)

Spike constituent	Original amount found (ppb)	Sample result			Duplicate sample result		
		Amount spiked (ppb)	Amount recovered (ppb)	Percent* recovery[a] (%)	Amount spiked (ppb)	Amount recovered (ppb)	Percent recovery[a] (%)
VOLATILES							
4. Benzene	<2	25	22.6	90	25	21.2	85
7. Carbon Tetrachloride	*						
9. Chlorobenzene	<2	25	24.8	99	25	25	100
14. Chloroform	*						
22. 1,1,-Dichloroethane	*						
23. 1,2-Dichloroethane	*						
24. 1,1-Dichloroethylene	<2	25	21.2	85	25	19.4	78
42. Tetrachloroethene	*						
43. Toluene	*						
45. 1,1,1-Trichloroethane	*						

*No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the volatile constituents. The lower average percent recovery is 90.75% from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original found, and C_t = amount spiked.

Source: USEPA 1988h.

Table B-10

Spike constituent	Original amount found (ppb)	Sample result Amount spiked (ppb)	Sample result Amount recovered (ppb)	Sample result Percent* recovery[a] (%)	Duplicate sample result Amount spiked (ppb)	Duplicate sample result Amount recovered (ppb)	Duplicate sample result Percent recovery[a] (%)
VOLATILES (continued)							
47. Trichloroethene	<2	25	26.8	107 [b]	25	28	112 [b]
AVERAGE RECOVERY FOR VOLATILES				93.5			90.75
SEMIVOLATILES (BASE/NEUTRAL FRACTION)							
52. Acenaphthene	<2	50	55	110 [b]	50	55	110 [b]
68. Bis(2-chloroethyl)ether	+						
70. Bis(2-ethylhexyl) phthalate	+						
88. 1,4,-Dichlorobenzene	<2	50	45	90	50	49.5	99
98. Di-n-butylphthalate	+						
102. 2,4-Dinitrotoluene	<50	50	53.5	107 [b]	50	55	110 [b]
105. N-Nitroso-di-n-propylamine	<5	50	60	120 [b]	50	65	130 [b]

+No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the semivolatile (base/neutral) constituents. The lower average percent recovery is 94.16 from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-11

Spike constituent	Original amount found (ppb)	Sample result			Duplicate sample result		
		Amount spiked (ppb)	Amount recovered (ppb)	Percent* recovery[a] (%)	Amount spiked (ppb)	Amount recovered (ppb)	Percent recovery[a] (%)
VOLATILES							
4. Benzene	<2	25	22.6	90	25	21.2	85
7. Carbon Tetrachloride	*						
9. Chlorobenzene	<2	25	24.8	99	25	25	100
14. Chloroform	*						
22. 1,1,-Dichloroethane	*						
23. 1,2-Dichloroethane	*						
24. 1,1-Dichloroethylene	<2	25	21.2	85	25	19.4	78
42. Tetrachloroethene	*						
43. Toluene	*						
45. 1,1,1-Trichloroethane	*						

*No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the volatile constituents. The lower average percent recovery is 90.75% from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original found, and C_t = amount spiked.

Source: USEPA 1988h.

Table B-12

Spike constituent	Original amount found (ppb)	Sample result			Duplicate sample result		
		Amount spiked (ppb)	Amount recovered (ppb)	Percent* recovery[a] (%)	Amount spiked (ppb)	Amount recovered (ppb)	Percent recovery[a] (%)
VOLATILES (continued)							
47. Trichloroethene	<2	25	26.8	107 [b]	25	28	112 [b]
AVERAGE RECOVERY FOR VOLATILES				93.5			90.75
SEMIVOLATILES (BASE/NEUTRAL FRACTION)							
52. Acenaphthene	<2	50	55	110 [b]	50	55	110 [b]
68. Bis(2-chloroethyl)ether	+						
70. Bis(2-ethylhexyl) phthalate	+						
88. 1,4,-Dichlorobenzene	<2	50	45	90	50	49.5	99
98. Di-n-butylphthalate	+						
102. 2,4-Dinitrotoluene	<50	50	53.5	107 [b]	50	55	110 [b]
105. N-Nitroso-di-n-propylamine	<5	50	60	120 [b]	50	65	130 [b]

+No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the semivolatile (base/neutral) constituents. The lower average percent recovery is 94.16 from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-13

		Sample result			Duplicate sample result		
Spike constituent	Original amount found (ppb)	Amount spiked (ppb)	Amount recovered (ppb)	Percent* recovery[a] (%)	Amount spiked (ppb)	Amount recovered (ppb)	Percent recovery[a] (%)
SEMIVOLATILES (continued)							
109. Fluorene	+						
110. Hexachlorobenzene	+						
113. Hexachloroethane	+						
121. Naphthalene	+						
136. Pentachlorobenzene	+						
141. Phenanthrene	+						
145. Pyrene	<2	50	60	120 [b]	50	46	92
148. 1,2,4,5-Tetrachlorobenzene	+						
150. 1,2,4-Trichlorobenzene	<5	50	37.5	75	50	40	80
AVERAGE RECOVERY FOR SEMIVOLATILES (BASE/NEUTRAL)				94.16			95.1

+No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the semivolatile (base/neutral) constituents. The lower average percent recovery is 94.16% from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-14

Spike constituent	Original amount found (ppb)	Sample result Amount spiked (ppb)	Sample result Amount recovered (ppb)	Sample result Percent* recovery[a] (%)	Duplicate sample result Amount spiked (ppb)	Duplicate sample result Amount recovered (ppb)	Duplicate sample result Percent recovery[a] (%)
VOLATILES							
4. Benzene	<2	25	21	84	25	17	68
7. Carbon Tetrachloride	*						
9. Chlorobenzene	<2	25	29	116 [a]	25	23	92
14. Chloroform	*						
21. Dichlorodifluoromethane	*						
22. 1,1-Dichloroethane	*						
23. 1,2-Dichloroethane	*						
24. 1,1-Dichloroethylene	<2	25	12	48	25	11	44
42. Tetrachloroethene	*						
43. Toluene	*						

*No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the volatile constituents. The lower average percent recovery is 76% from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-15

Spike constituent	Original amount found (ppb)	Sample result			Duplicate sample result		
		Amount spiked (ppb)	Amount recovered (ppb)	Percent* recovery[a] (%)	Amount spiked (ppb)	Amount recovered (ppb)	Percent recovery[a] (%)
VOLATILES (continued)							
45. 1,1,1-Trichloroethane	**						
47. Trichloroethene	<2	25	21	84	25	27	108 [a]
AVERAGE PERCENT RECOVERY FOR VOLATILE				79			76
SEMIVOLATILES (Base/Neutral Fraction)							
52. Acenaphthene	<5	50	51	102 [a]	50	51	102 [a]
68. Bis(2-chloroethyl)ether	+						
88. 1,4-Dichlorobenzene	<2	50	34	68	50	35	70
98. Di-n-butylphthalate	+						
102. 2,4-Dinitrotoluene	<2	50	43	86	50	42	84
105. N-Nitroso-di-n-propylamine	<5	50	50	100 [a]	50	46	92 [a]

+No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the semivolatile (base/neutral) constituents. The lower average percent recovery is 83.3% from the duplicate sample result.

[a] Percent recovery = $100 \times (C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-16

Spike constituent	Original amount found (ppb)	Sample result: Amount spiked (ppb)	Sample result: Amount recovered (ppb)	Sample result: Percent recovery[a] (%)	Duplicate sample result: Amount spiked (ppb)	Duplicate sample result: Amount recovered (ppb)	Duplicate sample result: Percent recovery[a] (%)
SEMIVOLATILES (continued)							
109. Fluorene	+						
110. Hexachlorobenzene	+						
113. Hexachloroethane	+						
121. Naphthalene	+						
136. Pentachlorobenzene	+						
141. Phenanthrene	+						
145. Pyrene	<2	50	43	86	50	43	86
148. 1,2,4,5-Tetrachlorobenzene	+						
150. 1,2,4-Trichlorobenzene	<10	50	30	60	50	34	68
AVERAGE PERCENT RECOVERY FOR SEMIVOLATILES (BASE/NEUTRALS)				83.3			83.3

+No matrix spike was performed for this constituent. The percent recovery for this constituent is based on the lower average percent recovery of the semivolatile (base/neutral) constituents. The lower average percent recovery is 83.3% from the duplicate sample result.

[a] Percent recovery = 100 x $(C_i - C_o)/C_t$, where C_i = amount recovered, C_o = original amount found, and C_t = amount spiked.

[b] Recovery values greater than 100 percent were considered as just 100 percent.

Source: USEPA 1988h.

Table B-17 Matrix Spike Recovery Data for Kiln Ash Residuals from Rotary Kiln Incineration of K087 Waste

Constituent	Sample percent recovery	Duplicate percent recovery
Volatile Organics		
1,1-Dichloroethane	114[b]	114[b]
Trichloroethene	114[b]	114[b]
Chlorobenzene	106[b]	106[b]
Toluene	106[b]	104[b]
Benzene	100[b]	98
(Average of volatiles)	(100)	(99.6)
Semivolatile Organics (acid-extractable)		
Pentachlorophenol	7[a]	11[a]
Phenol	77	80
2-Chlorophenol	78	83
4-Chloro-3-methylphenol	92	87
4-Nitrophenol	37	35
(Average of acid extractables)	(71)[a]	(71.25)[a]
Semivolatile Organics (base/neutral-extractable)		
1,2,4-Trichlorobenzene	84	89
Acenaphthene	93	91
2,4-Dinitrotoluene	121[b]	109[b]
Pyrene	34	39
N-Nitroso-di-n-propylamine	82	84
1,4-Dichlorobenzene	79	89
(Average of base/neutral extractables)	(78.6)	(82)
Metals (total concentration analysis)		
Antimony	23	22
Arsenic	44	48
Barium	78	76
Beryllium	78	78
Cadmium	76	88
Chromium	76	83
Copper	73	77
Lead	104	82
Mercury	120	100
Nickel	78	98
Selenium	92	92
Silver	72	72
Thallium	48	76
Vanadium	80	80
Zinc	78	80

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[a] Recovery values less than 20 percent were not used.

[b] Recovery values greater than 100 percent are considered as just 100 percent.

Source: USEPA 1988b.

Table B-18 Matrix Spike Recovery Data for Scrubber Water Residuals from Rotary Kiln Incineration of K087 Waste

Constituent	Sample percent recovery	Duplicate percent recovery
Volatile Organics		
1,1-Dichloroethane	110[b]	106[b]
Trichloroethene	114[b]	112[b]
Chlorobenzene	112[b]	106[b]
Toluene	124[b]	124[b]
Benzene	106[b]	108[b]
(Average of volatiles)	(100)	(100)
Semivolatile Organics (acid-extractable)		
Pentachlorophenol	107[b]	85
Phenol	96	93
2-Chlorophenol	106[b]	108[b]
4-Chloro-3-methylphenol	107[b]	103[b]
4-Nitrophenol	117[b]	118[b]
(Average of acid-extractables)	(100)	(100)
Semivolatile Organics (base/neutral-extractable)		
1,2,4-Trichlorobenzene	77	85
Acenaphthene	104[b]	94
2,4-Dinitrotoluene	125[b]	124[b]
Pyrene	143[b]	136[b]
N-Nitroso-di-n-propylamine	104[b]	98
1,4-Dichlorobenzene	78	87
(Average of base/neutral extractables)	(92.5)	(94)
Metals (total concentration)		
Antimony	110	117
Arsenic	83	64
Barium	94	88
Beryllium	87	87
Cadmium	94	92
Chromium	91	94
Copper	94	98
Lead	84	87
Mercury	58	58
Nickel	84	89
Selenium	108	90
Silver	76	80
Thallium	20	18
Vanadium	96	98
Zinc	88	91
Inorganics		
Cyanide	88	78

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[b] Recovery values greater than 100 percent are considered as just 100 percent.

Source: USEPA 1988b.

Table B-19 Matrix Spike Recoveries for Semivolatile Organic Compounds for K101 Scrubber Water

			Sample Set 3		Sample Set 3 duplicate		
Spike Constituent	Original Amount Found (µg/l)	Amount Spiked (µg/l)	Amount Recovered (µg/l)	Percent Recovery[a]	Amount Recovered (µg/l)	Percent Recovery[a]	Relative Percent Difference[b]
Base/neutral extractables							
1,2,4-Trichlorobenzene	ND	100	40	40	41	41	2
Acenaphthalene	ND	100	55	55	58	58	5
2,4-Dinitrotoluene	ND	100	42	42	53	53	23
Pyrene	ND	100	62	62	63	63	2
N-Nitrosodi-n-propylamine	ND	100	59	59	60	60	2
1,4-Dichlorobenzene	ND	100	33	33	33	33	0
Average of base/neutral recoveries				48.5	51.3		
Acid extractables							
Pentachlorophenol	ND	200	101	51	105	53	4
Phenol	ND	200	119	60	115	58	3
2-Chlorophenol	ND	200	124	62	117	59	5
4-Chloro-3-methylphenol	ND	200	138	69	146	73	6
4-Nitrophenol	ND	200	0	0	0	0	0

ND - Not detected. Value assumed to be zero in calculation for percent recovery.

[a] Percent Recovery = 100 (Ci - Co)/C_t, where Co is the initial concentration; Ci is the concentration of the spiked aliquot; and C_t is the concentration of the spike added.

[b] Relative Percent Recovery = 100 $(D_1 - D_2)/((D_1 + D_2)/2)$, where D_1 is the larger of the two observed values for Percent Recovery.

Source: USEPA 1988d.

Table B-20 Matrix Spike Recoveries for Semivolatile Organic Compounds for K101 Kiln Ash

			Sample Set 3		Sample Set 3 duplicate		
Spike Constituent	Original Amount Found (µg/l)	Amount Spiked (µg/l)	Amount Recovered (µg/l)	Percent Recovery[a]	Amount Recovered (µg/l)	Percent Recovery[a]	Relative Percent Difference[b]
Base/neutral extractables							
1,2,4-Trichlorobenzene	ND	100	41	41	39	39	5
Acenaphthalene	ND	100	41	41	39	39	5
2,4-Dinitrotoluene	ND	100	48	48	47	47	2
Pyrene	ND	100	46	46	45	45	2
N-Nitrosodi-n-propylamine	ND	100	46	46	45	45	2
1,4-Dichlorobenzene	ND	100	40	40	39	39	3
Recovery average of base/neutral extractables				43.6		42.3	
Acid extractables							
Pentachlorophenol	ND	200	60	30	50	25	18
Phenol	ND	200	81	41	79	40	2
2-Chlorophenol	ND	200	81	41	78	39	5
4-Chloro-3-methylphenol	ND	200	93	47	88	44	7
4-Nitrophenol	ND	200	66	33	64	32	3

ND - Not detected. Value assumed to be zero in calculation for percent recovery.

[a] Percent Recovery = $100 (Ci - Co)/C_t$, where Co is the initial concentration; Ci is the concentration of the spiked aliquot; and C_t is the concentration of the spike added.

[b] Relative Percent Recovery = $100 (D_1 - D_2)/((D_1 + D_2)/2)$, where D_1 is the larger of the two observed values for Percent Recovery.

Source: USEPA 1988d.

Table B-21 Matrix Spike Recoveries for Stabilized F006 Nonwastewater Residuals

Constituent	Original amount found (ppm)	Duplicate (ppm)	% Error	Actual Spike	% Recovery	Accuracy correction factor[a]
Lead	0.3226	0.3091	2.14	4.9619	92.9	1.08
	0.2142	0.2287	3.27	4.6930	89.4	1.12

[a] Accuracy correction factor = 100 ÷ percent recovery.

Source: Memo to R. Turner, USEPA/HWERL, from Jesse R. Conner, Chemical Waste Management, dated January 20, 1988.

Table B-22 Matrix Spike Recovery for Metals for the TCLP Extract for K061 for Horsehead Resource Development Co.

BDAT constituent	Original sample (ug/l)	Sample set 4			Sample set duplicate 4		Correction factor
		Spike added (ug/l)	Spike result (ug/l)	Percent recovery[a]	Spike result (ug/l)	Percent recovery[a]	
Lead	<5.0	25	22	88	19	76	1.32

[a] Percent recovery = [(spike result - original amount)/spike amount] x 100%.

Note: RPD = [(S1-S2)/(S1+S2)/2)] x 100, where S1 is the larger of the percent recoveries.

Source: Onsite Engineering Report for Horsehead Resource Development Co.